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ERRATA.

Page 20, line 30, for *Hausemannia* read *Hansemannia.*
,, 30, ,, 5 from bottom, *for* Juspia *read* Jurpia.
,, 60, ,, 28, for *alternata* read *attenuata.*
,, 72, ,, 6 from bottom, *for* WATSONINIANA *read* WATSONIANA.
,, 74, ,, 8 from bottom, for *piscicarpa* read *pisocarpa.*
,, 81, ,, 21, *for* **Tetraceras** read **Tetracera.**
,, 191, ,, 15, *for* SOPUBEA *read* SOPUBIA.
,, 192, ,, 9 (the same correction).
,, 243, lines 8 & 9, for *coronifolia* read *coronopifolia.*
,, 275, line 14, for *parvifolia* read *parviflora.*
,, 292, ,, 31, for *Jardinianum* read *Jadinianum.*
,, 295, ,, 8, for *lacertum* read *laceratum.*
,, 296, lines 13 & 14, for *parasiticus,* Sauv., read *parasiticum,* De Toni.
,, 326, line 21, *for* AUTUNESII *read* ANTUNESII.
Plate **9**, headline, *for* Bruce *read* Brown.

THE JOURNAL

OF

THE LINNEAN SOCIETY.

List of the CARICES of Malaya. By C. B. CLARKE, F.L.S.

[Read 3rd March, 1904.]

THIS List comprises all the species of *Carex* known to me from Malaya, with short diagnoses of those considered new. By "Malaya" is understood the Archipelago from Sumatra to the Philippines and New Guinea, together with the Malay and Tonkin Peninsulas. The material used is that in the Kew Herbarium. Dr. A. Zahlbruckner, of the Vienna Hofmuseum, to whom I was introduced by Dr. O. Stapf, kindly sent for my examination several types of Zollinger, of great value for establishing the names of Zollinger and Miquel. I regret that I have not been able to make any use of the fine collection in the British Museum. To avail myself of these, I must have transported the whole of my MSS. thither; and it would have taken me more time than I can give to work out the specific names of the critical species from my own technical descriptions. Further, I do not think it would have strengthened this paper to have added such determinations; I should not have felt sure enough of the exact agreement of the plants. It would of course have been different if I could have laid the plants side by side, when the identification would have been more certain as well as more speedy.

The Malay *Carex* consists (here) of 54 species; of which 36, including all the new ones (11), belong to one subgenus, *Caricandra.* This subgenus includes, in the World, 125 species; of these, 19 recede from the usual habit of the subgenus by the stem having only 1–5 spikes; these 19 show affinities to species in various other subgenera of *Carex.* The main, typical, *Caricandræ*, 106 in number, with numerous spikes, sometimes called the Section "*Indicæ*," form a natural group of species, very homogeneous, and therefore very difficult to separate into species. They are an essentially Tropical group, of which 77 occur in South-east Asia, 16 in Tropical Africa, 13 in Tropical America; there is no *Carex* in Palæarctica or Nearctica that can be compared with them; the culm bears numerous (10–200) spikes.

In the Flora of British India, the group Indicæ contains 52 species out of a total of 142 *Carex* in India. That the Malay Flora should possess 36 species of Indicæ, out of a total of 54 *Carex*, is therefore what might have been expected. The group Indicæ, however, becomes much scarcer in China, and only a few reach Japan, where other sections of *Carex* abound.

The Central American and Tropical African species of the group Indicæ are so closely allied structurally to the South-east Asiatic, that I have not found it possible to give absolute diagnoses to distinguish them; thus Boott made a Madagascar plant conspecific with *Carex bengalensis*, Roxb. At the same time, I do not find that the closely-allied *Carex* of this group from different continents match; I have therefore treated these species geographically. Several of the species described below as new were catalogued in Dr. Stapf's Kinabalu plants (Trans. Linn. Soc. ser. 2, Bot. vol. iv. [1893] p. 246) by me under old names: the corrections in the present paper are attempts to define geographic subspecies as species; that is to say, the Kinabalu *Carex* (group Indicæ) do not exactly match the closely-allied Indian.

The group Hemiscaposæ, as to the plants typically belonging to it, appears very plainly defined; there are at the very base and on the sterile tufts long, well-developed leaves; the stems have the peduncle-holding bracts short, and the stem-leaves, if any, are similar to and hardly longer than the bracts. Many species are thus definitely hemi-scapose. But the character in many other species is less marked, and we have finally a large number of species which may be put in some other group altogether or may be attached to the Hemiscaposæ. Dr. Theodore Holm believes that he is always able to locate the species in its true affinity when he is able to cultivate it for a few seasons; but this does not help the arrangement of *Carex* in a large herbarium.

I have run out this list short, and have cited (mainly) new synonyms only, not those which have been cited before. One of the most curious is *Carex glaucescens*, Elliott, a plant of the South-east United States, which belongs to a section that always has a trifid style. Boott, however, says (Carex, pp. 89 & 90) that it has occasionally a bifid style. The American authors also say it has a trifid or bifid style. I found the example with bifid style in herb. Boott, collected at the Isle of Pines, with a note by Boott that the Isle of Pines is close to Cuba. But this sheet was collected by Milne in the Isle of Pines near New Caledonia, and is totally unlike the American *C. glaucescens*, Elliott. In *C. glaucescens* the style is always trifid, in *C. phacodes*, Spreng., it is always bifid.

CONSPECTUS *of the* MALAY CAREX.

Subgenus I. **VIGNEANDRA.** Style bifid. Spikes (many of them) female at base, male at top.

Sect. A. BREVISPICÆ. Spikes less than ½ in. long.

1. *C. Thomsoni*. 2. *C. nubigena*.

Sect. B. LONGISPICÆ. Spikes linear-lanceolate, an inch long or more.

3. *C. brunnea*. 4. *C. Graeffeana*.

Subgenus II. **VIGNEGYNE.** Style bifid. Spikes (many of them) male at base, female at top.

Sect. 1. REMOTÆ. Spikes sessile, less than ⅔ in. long.

5. *C. alta*. 6. *C. remota*.

Sect. 2. CERNUÆ. Spikes peduncled, 1–1¾ in. long.

7. *C. cernua*.

Subgenus III. **EUVIGNEA.** Style bifid. Terminal spike wholly male.

a. Female glumes muticous.

8. *C. Gaudichaudiana*.

b. Female glumes aristellate.

9. *C. phacodes*. 10. *C. pruinosa*.

Subgenus IV. **CARICIMIA.** Style trifid. Stem with one spike only.

11. *C. rara*. 12. *C. capillacea*.

Subgenus V. **CARICANDRA.** Style trifid. Terminal spike (and often many others) male at top, female at base (no spikes male at base, female at top).

Sect. A. HEMISCAPOSÆ. Flowering stems scapiform, with short (or no) leaves; the basal leaves, and those on sterile tufts, often very long.

13. *C. scaposa.* 14. *C. cryptostachys.*

Sect. B. POLYSTACHEÆ. Stems not scapiform, with 10–200 spikes.

* **Brevispicæ.** Spikes short, rarely up to 10–15 mm. long.

† *Stramentitiæ.* Spikes straw-coloured.

15. *C. indica.* 16. *C. Dietrichiæ.* 17. *C. stramentitia.* 18. *C. repanda.* 19. *C. perakensis.* 20. *C. malaccensis.*

†† *Cruciatæ.* Spikes not straw-coloured.

21. *C. cruciata.* 22. *C. gembolensis.* 23. *C. Rafflesiana.* 24. *C. scaberrima.* 25. *C. fuirenoides.* 26. *C. Horsfieldii.* 27. *C. Balansai.* 28. *C. Cumingii.*

††† *Filicinæ.* Spikes not straw-coloured, rather slenderer than in †† *Cruciatæ.*

29. *C. filicina.* 30. *C. continua.* 31. *C. spatiosa.* 32. *C. neo-guinensis.* 33. *C. saturata.* 34. *C. rhizomatosa.*

** **Longispicæ.** Spikes linear-cylindric, more than 2 cm. long.

a. Peduncles (some) 2 or more from one bract-sheath.

35. *C. arridens.* 36. *C. hypsophila.* 37. *C. Havilandi.* 38. *C. turrita.* 39. *C. sumatrensis.*

b. Peduncle never more than one from each bract-sheath.

40. *C. baccans.* 41. *C. curvirostris.* 42. *C. tonkinensis.* 43. *C. composita.*

Sect. C. OLIGOSTACHYÆ. Stems not scapiform, with 1–5 (rarely 8) spikes.

α. **Psilosaccæ.** Utricles glabrous.

44. *C. borneensis.* 45. *C. speciosa.*

β. **Trichosaccæ.** Utricles hairy.

46. *C. Loheri.* 47. *C. madoerensis.* 48. *C. longibracteata.*

Subgenus VI. **PROPRIÆ**. Style trifid. Terminal spike wholly male.

a. Utricles glabrous.

49. *C. olivacea.* 50. *C. Jackiana.* 51. *C. tumida.*
52. *C. Pseudocyperus.*

b. Utricles hairy.

53. *breviculmis.* 54. *C. Wallichiana.*

Subgenus I. VIGNEANDRA.

1. CAREX THOMSONI, *Boott, Carex,* i. (1858) p. 1. t. **1**; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) pp. 212, 239 (Thompsoni).

Tonkin; Balansa n. 2820.

Distrib. North-east India. Ichang.

2. CAREX NUBIGENA, *D. Don, in Trans. Linn. Soc.* xiv. (1825) p. 326.

Distrib. From Cabul to Ceylon, Yunnan and Japan.

Var. *β. fallax*; stricta, culmo 4–6 dm. longo; foliis in sicco arcte convolutis; inflorescentiâ 12 mm. longâ, 8–10 mm. latâ, pyramidali, densâ; bracteâ inferiore 3–4 cm. longâ, suberectâ; utriculo in rostrum subito angustato, in parte superiore interdum a glandulis consperso; rostro lineari, basi lineari-conico, in marginibus scabro subserrulato.

C. fallax (sp.), *Steud. in Zoll. Verz. Ind. Archip.* ii. p. 60, *Cyp.* p. 189; *Miq. Fl. Nederl. Ind.* iii. p. 347; *Boeck. in Linnæa,* xxxix. (1875) p. 57.

C. pterolepta, *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) pp. 215, 239.

Java; alt. 1750 metr., Zollinger n. 2554 *fide* Miquel; sine habitat, Kurz (in hb. Kew).

Distrib. Yunnan.

3. CAREX BRUNNEA, *Thunb. Fl. Jap.* (1784) p. 38; *Drake, Fl. Ins. Pacif.* p. 336; *Hook. f. in Trimen, Fl. Ceylon,* v. p. 103; *Franch. in Nouv. Arch. Mus.* sér. 3, viii. (1896) pp. 241, 259.

Celebes; alt. 2500–3000 metr., Everett n. 38.

Distrib. Mascarenia, India, China, Japan, Australia, Polynesia to the Sandwich Islands; a common plant.

4. CAREX GRAEFFEANA, *Boeck.*! *in Flora,* lviii. (1875) p. 123.

Ins. Philippine; Benguet, Loher n. 699.

Distrib. Samoa.

Subgenus II. VIGNEGYNE.

5. CAREX ALTA, *Boott, in Proc. Linn. Soc.* i. (1845) p. 254; *Carex*, p. 59, t. 153.

C. Brizopyrum, *Kunze, Suppl. Schkuhr*, p. 169, t. 43.

Java; Horsfield n. 10, Forbes nn. 1110, 1120.

Distrib. North-east India; and a var. (*Rochebruni*, Franchet) in Japan.

6. CAREX REMOTA, *Linn. Amœn. Acad.* iv. (1759) p. 293; *Sp. Pl.* ed. 2, p. 1383.

Common in the cool North Temperate Zone of the Old World, extending to Sitka and Japan.

Var. *Rochebruni*, C. B. Clarke, in Hook. f. Fl. Brit. Ind. vi. p. 706 (syn. Franch. et Savat. excl.).

Java; Zollinger n. 3192.

Distrib. Abundant in the Himalaya; also in China.

7. CAREX CERNUA, *Boott, Carex*, iv. (1867) p. 171, t. 578, non *Franchet*.

C. lobolepis, *F. Muell.*! *Fragm. Phyt. Austral.* viii. p. 258.

C. phacota, *Franch. in Nouv. Arch. Mus. Par.* sér. 3, ix. (1897) pp. 117, 158, non. *Spreng.*

Tonquin; Balansa nn. 221, 2826.

Distrib. North-east India, China, Japan. New South Wales.

Subgenus III. EUVIGNEA.

8. CAREX GAUDICHAUDIANA, *Kunth, Enum. Pl.* ii. (1837) p. 417; *Hook. f. Fl. Tasm.* ii. p. 99, t. 151 A.

C. vulgaris, var. Gaudichaudiana, *Boott, Carex*, p. 169 partim.

C. cæspitosa, *R. Brown, Prodr.* p. 242.

C. contracta, *F. Muell. Fragm. Phyt. Austral.* viii. p. 258.

Neo-Guinea; Guilianetti et English.

Distrib. Australia. New Zealand.

9. CAREX PHACODES, *Spreng. Syst.* iii. (1826) p. 826, errore typogr. phacota; *Boott, Carex*, i. (1858) p. 63, t. 168; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, ix. (1897) p. 117 pro parvâ parte; *Hook. f. in Trimen, Flora Ceylon*, v. p. 104.

C. lenticularis, *D. Don, in Trans. Linn. Soc.* xiv. (1825) p. 331, non *Michaux*.

C. platycarpa, *Steud. Cyp.* p. 214.

C. rubro-brunea, *Franch.*! *in Nouv. Arch. Mus. Par.* sér. 3, ix. (1897) pp. 123, 159, non *C. B. Clarke.*

C. glaucescens, *Boott*! *Carex,* p. 89, quoad exempla stylo 2-fido.

(The name "phacodes" is a translation merely by Sprengel of "lenticularis.")

Java; Horsfield, H. O. Forbes n. 426.

Distrib. Cape of Good Hope. India. China. Japan. Polynesia.

10. CAREX PRUINOSA, *Boott, in Proc. Linn. Soc.* i. (1845) p. 255; *Carex,* p. 65, t. 174.

C. pruinosa, var. β. picta, *Boott, Carex,* p. 198; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, ix. (1897) pp. 155, 162.

C. picta, *Boott, in Mem. Amer. Acad.* n. s. vi. (1859) p. 418.

C. dimorpholepis, *Steud. Cyp.* p. 214.

C. Maximowiczii, *Miq. Ann. Mus. Lugd.-Bat.* ii. p. 150.

Java; Horsfield.

Distrib. Khasia. China. Japan.

Subgenus IV. CARICIMIA.

11. CAREX RARA, *Boott, in Proc. Linn. Soc.* i. (1845) p. 284, *Carex,* p. 44, t. 109; *Hook. f. in Trimen, Fl. Ceylon,* v. p. 105; *Stapf, in Trans. Linn. Soc.* ser. 2, *Bot.* iv. (1894) p. 246.

Borneo; Kinabalu, alt. 3500 metr., Haviland n. 1393.

Distrib. Ceylon. North-east India.

12. CAREX CAPILLACEA, *Boott, Carex,* i. (1858) p. 44 t. 110; *Benth. Fl. Austral.* vii. pp. 436, 437; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) pp. 197, 209 (synn. C. naná, C. ontakensi excl.); *Meinsh. in Act. Hort. Petrop.* xviii. (1901) pp. 286, 316 partim.

C. capitellata, *Boiss. Fl. Orient.* v. p. 399.

C. simplicissima, *F. Muell. Fragm. Phyt. Austral.* ix. p. 191.

Ins. Philippine; Benguet, Loher n. 705.

Distrib. South-east Asia, extending to Lazistan, Sachalin, and New South Wales.

Subgenus V. CARICANDRA.

13. CAREX SCAPOSA, *Hook. f. Bot. Mag.* cxiii. (1887) t. 6940 *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) pp. 255, 260.

Distrib. China.

Var. *β. baviensis*, Franch.! in Nouv. Arch. Mus. Par. sér. 3, viii. (1896) p. 255.

Tonkin; Mons Bavi, alt. 800 metr., Balansa n. 2815.

14. CAREX CRYPTOSTACHYS, *Brongn. in Duperrey, Voy. Coquille*, (1829) p. 152, t. 25; C. cyrtostachys, *C. B. Clarke, in Hook. f. Fl. Brit. Ind.* vi. p. 714, errore typogr.

Penang; Wallich n. 3383. Perak; alt. 1000 metr., hb. King n. 8517. Singapore; Ridley n. 1720.

Tonkin; Balansa nn. 2822, 2823. Java; Zollinger, *fide* Miquel.

Distrib. Also in Hongkong and Waigiou.

15. CAREX INDICA, *Linn. Mant. alt.* (1771) p. 574; nec *Kunth* nec *Nees*.

C. Moritzii, *Steud.! in Zoll. Verz. Ind. Archip.* Heft 2, p. 60, *Cyp.* p. 207; *Miq. Fl. Nederl. Ind.* iii. p. 350; *J. Schmidt, in Bot. Tidsskr.* xxiv. (1901) p. 38.

Trang; Kunstler n. 1383. Penang; alt. 250 metr., hb. King n. 1496. Kedah; alt. 750 metr., Ridley n. 5147.

Java; Zollinger n. 313. Cochinchina; Pierre n. 1881.

Var. *β. læte-brunnea*, C. B. Clarke, in Hook. f. Fl. Brit. Ind. vi. p. 715, in Journ. Linn. Soc., Bot. xxxiv. (1898) p. 115.

C. indica, *Boott, Carex*, ii. (1860) p. 87, t. 251; *Boeck. in Linnæa*, xl. (1876) p. 347 partim; *Hook. f. in Trimen, Fl. Ceylon*, vi. pp. 102, 108.

C. bengalensis, *Thwaites! Enum. Pl. Zeyl.* p. 355 partim.

C. longi-aristata, *Kurz, in Journ. Asiat. Soc. Beng.* xlv. pars 2 (1876) p. 160.

C. Thwaitesii, *Boott*! MS.

C. fissilis, *Boott*! MS. partim.

Pahang; Ridley n. 2145. Johore; Ridley n. 4099.

Distrib. Ceylon. Tenasserim.

16. CAREX DIETRICHIÆ, *Boeck.! in Flora*, lviii. (1875) p. 122.

C. indica, *Linn.*, var. *β.*, *Boott, Carex*, ii. (1860) p. 87, t. 254.

C. indica, *Linn.*, var Milnei, *C. B. Clarke, in Hook. f. Fl. Brit. Ind.* vi. p. 715.

C. fuirenoides, *Boott, Carex*, ii. (1860) p. 156, non *Gaudich.*

C. Milnei, *Boott*! MS.

C. dispar, *Boott*! MS.

Pahang; Ridley n. 2143 *a*. Borneo; Beccari n. 2741. North Borneo; Creagh.

Distrib. Queensland. Polynesia.

17. **Carex stramentitia**, *Boeck. in Linnæa*, xl. (1876) p. 351.

Tonkin; Balansa n. 2819.

Distrib. Assam. Chota Nagpore. Himalaya, west to Nepaul.

18. **Carex repanda**, *C. B. Clarke, in Hook. f. Fl. Brit. Ind.* vi. (1894) p. 720.

Khasia.

Var. *β. implumis*; paniculis partialibus pluribus evolutis, apertis, compositis, polystachyis.

There are here no ripe examples of this plant, which may be a new species.

Perak; alt. 75 metr., Wray n. 1982.

Distrib. Also in Yunnan.

19. **Carex perakensis**, *C. B. Clarke, in Hook. f. Fl. Brit. Ind.* vi. (1894) p. 720.

Perak; Wray. Selangor; Ridley.

20. **Carex malaccensis**, *C. B. Clarke, in Hook. f. Fl. Brit. Ind.* vi. (1894) p. 722.

Langkawi; Ridley n. 1669.

21. **Carex cruciata**, *Wahlenb. in Vet.-Akad. Stockh. Handl.* xxiv. (1803) p. 149, non *Nees*; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) pp. 253, 260.

C. bengalensis, *Roxb. Fl. Ind.* iii. p. 572; *Benth. Fl. Hongk.* p. 401.

C. valida, *Nees, in Wight Contrib.* p. 123.

C. indica, *Munro, in Seem. Voy. 'Herald,'* p. 423, non *Linn.*

C. indica, "forma altera," *Hook. f.*! *in Trimen, Fl. Ceylon,* vi. p. 109 in Obs.

C. vacua, *Boeck. in Linnæa*, xl. (1876) p. 343 partim; *Boott*! MS.

C. Bruceana, *Boott*! MS.; cf. *Boott, Carex,* ii. (1860) p. 85.

C. stramentitia, *Franch. in Bull. Soc. Philom.* sér. 8, vii. (1895) p. 33, fide *Franchet,* non *Boott.*

C. condensata, *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) p. 252; *Boott*! MS.

C. canaliculata, *Boott* MS.

Perak; alt. 150 metr., hb. King n. 1906.

Distrib. India (common). Madagascar. Formosa.

Var. *β. argocarpus*, C. B. Clarke, in Hook. f. Fl. Brit. Ind. vi. p. 716.

C. benghalensis, *Boott, Carex,* ii. (1860) p. 85, pro magnâ parte tt. 240–242.

C. vacua, *Boott* MS. partim.
C. condensata, *Boott* MS. partim.
Tonkin; Balansa nn. 2816, 2817.
Distrib. Assam to Nepaul, common.

22. Carex gembolensis, sp. nova; utriculis 2–2½ mm. longis, copiose (sæpe usque ad basin) hispido-pilosis, enervatis aut fere enervatis; cæteroquin ut *C. filicina*, Nees.

C. Rafflesiana?, *Boott*! MS.

Paniculæ partiales 5–6, pyramidales; pedunculi usque ad 10–14 cm. longi, interdum geminati. Spicæ 8–10 mm. longæ, basi 2–5-nucigeræ, plures apice masculæ. Utriculi ellipsoidei trigoni, paullo curvati, in rostrum lineari-conicum angustati.

Java; prov. Modjokerto, Mt. Gembolo 4300′, Zollinger, ser. 2, n. 7.

Var. *β. timorensis*; inflorescentiâ debiliore, laxâ; paniculis partialibus 5 cm. longis, 3 cm. latis, admodum laxis.

Timor; alt. 1000 metr., F. Newton.

23. Carex Rafflesiana, *Boott*! *in Trans. Linn. Soc.* xx. (1846) p. 132, *Carex*, i. (1858) p. 12, t. 33, var. *β* incl.

Java; Horsfield; Mt. Tidjeng 2000′, Zollinger, Forbes n. 785.
Celebes; Minahassa, Koorders nn. 16674 *β*, 16669 *β*.

Var. *β. tenuior*; magis attenuata, foliis angustioribus, paniculis partialibus lineari-lanceolatis; utriculis fere glabratis aut in rostro parcius pilosis.

C. virgata, *Miq. Fl. Nederl. Ind.* iii. (1855–9) p. 351, neque *Hook. f.* (1853).
C. bengalensis, var. *β*. virgata, *Boeck.*! *in Linnæa,* xl. (1876) p. 347.
C. vesiculosa? *Boott*! MS.

Java; Mt. Tidjen, alt. 1750 metr., Zollinger. Sumatra; alt. 2750 metr., Forbes n. 2389. Ins. Molucca; Ternate, alt. 1000 metr., Moseley.

24. Carex scaberrima, sp. nova; inflorescentiâ 45 cm. longâ, 4 cm. latâ; paniculis partialibus usque ad 8 cm. longis, 15 mm. latis, compositis, ramis ramulisque erectis hispide pilosis; spicarum fasciculis pernumerosis, congestis; spicis innumerosis, parvis.

C. bengalensis, var. *γ*. scaberrima, *Boeck.*! *in Linnæa,* xl. (1876) p. 347.

Pedunculi usque ad 10–15 cm. longi, interdum geminati.

Luzon; Albany, Cuming n. 936.

25. Carex fuirenoides, *Gaudich.*! *in Freycinet, Voy.* (1826) p. 412; *Kunth, Enum. Pl.* ii. p. 508; non *Boott, Carex,* iv. (1867) t. 507.

C. fibrata, *Vidal*! *Phanerog. Cuming Philipp.* p. 67, *Pl. Vasc. Filip.* p. 286; *Boott*! MS.

C. indica, var. bengalensis, *F. Muell.*! *Fragm. Phytogr. Austral.* viii. p. 249.

C. fissilis, *Benth.*! *Fl. Austral.* vii. p. 441, non *Boott.*

Ins. Philippine; Cebu, Cuming n. 1764; Merrill n. 109.

Distrib. Queensland. Ins. Marianne.

26. Carex Horsfieldii, *Boott*! *in Proc. Linn. Soc.* i. (1845) p. 257, *Carex,* i. (1858) p. 11, t. 32; *Miq. Fl. Nederl. Ind.* iii. p. 349.

Java; Horsfield.

27. Carex Balansai, *Franch.*! *in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) pp. 258, 260.

Tonkin; Mt. Raui, Balansa n. 2828.

28. Carex Cumingii, *Vidal*! *Phanerog. Cuming* (1885) p. 156, *Pl. Vasc. Filip.* p. 286, non *Boott.*

Robusta. Folia usque ad 16 mm. lata. Inflorescentia 35 cm. longa, stricta; paniculæ partiales 4, remotæ, 5–6 cm. longæ, oblongo-lineares. Spicæ 7–10 mm. longæ, ovoideæ. Utriculi (rostro incluso) 3–3½ mm. longi, ovales, trigoni, multinervati, pilosi, rostrum cum ½ parte utriculi vix æquilongum.

Luzon; Albany, Cuming n. 1408. Luzon Central; Loher nn. 704, 712.

29. Carex filicina, *Nees*! *in Wight, Contrib.* (1834) p. 123; *Boott, Carex,* iii. (1862) p. 105 (varr. α, γ), tt. 311, 312; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) pp. 254, 260; *Hook. f. in Trimen, Fl. Ceylon,* v. pp. 102, 110.

C. cruciata, *Thwaites, Enum. Pl. Zeyl.* p. 355 partim.

Java; Horsfield n. 29; Gedeh, Usteri n. 214.

Luzon Central; Loher n. 707 B.

Distrib. India. China. A common species.

30. Carex continua, *C. B. Clarke, in Hook. f. Fl. Brit. Ind.* vi. (1894) p. 717.

C. Bruceana, *Boott*! MS. partim.

Luzon Central; Loher nn. 707, 708, 709, 710.

Distrib. Yunnan, Sikkim. Nepaul.

31. Carex spatiosa, *Boott! Carex*, i. (1858) p. 86; ii. (1860) p. 246; *Boeck. in Linnæa*, xl. (1876) p. 349.

Cochin-China; Gaudichaud.

Var. β. *bogorensis*; utriculis ovoideis; rostro cum ½–⅔ parte utriculi æquilongo, scabro.

C. indica, *Miq. Fl. Nederl. Ind.* iii. p. 350, non *Linn.*

Xerotes latifolia, *Hasskarl*, MS.

Java; *fide* Miquel. (I have seen the example "Hort. Bogor." of S. Kurz.)

32. Carex neo-guinensis, sp. nova; paniculis partialibus in spicas compositas rigidas, oblongas congestis; utriculis (rostro incluso) 3 mm. longis, quam ei *C. Lindleyanæ* gracilioribus; cæteroquin fere ut *C. Lindleyana*, Nees. Culmi 5–8 dm. longi. Folia 5 mm. lata. Paniculæ partiales c. 5, 3 cm. longæ, 8 mm. latæ, rubræ. Utriculi oblongo-ellipsoidei, glabri, rubentes; rostrum cum ½–¾ parte utriculi æquilongum, in marginibus hispidum, dentibus 2 longis lineari-lanceolatis.

Neo-Guinea; Guilianetti et English.

33. Carex saturata, sp. nova; paniculis partialibus 3–4, late oblongis, 6 cm. longis, 24 mm. latis, perdensis, saturate sanguineo-purpureis; spicis 10–14 mm. longis, basi fœmineis; utriculis (rostro incluso) 3–3½ mm. longis, ellipsoideis, glabris; rostro cum utriculo fere æquilongo, lineari, glabro.

C. filicina, *O. Stapf, in Trans. Linn. Soc.* ser. 2, *Bot.* iv. (1893) p. 246.

Folia 1 cm. lata. Glumæ fœmineæ saturate rubro-purpureæ. Utriculi purpureo-maculati.

Borneo; Kinabalu, alt. 3000 metr., Haviland n. 1402.

34. Carex rhizomatosa, *Steud. in Zoll. Verz. Ind. Archip.* Heft 2 (1854) p. 60, *Cyp.* p. 206; *Miq. Fl. Nederl. Ind.* iii. p. 348; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) p. 256.

C. Cumingiana, *Steud. Cyp.* p. 206; *Boott, Carex*, iii. (1862) p. 107, tt. 324, 325; *Boeck. in Linnæa*, xl. (1876) p. 367; *Vidal, Pl. Vasc. Filip.* p. 286.

C. capitulata, *Boott!* MS.

Tonkin; Balansa n. 3824. Sumbawa; Zollinger n. 3447 *fide* Steudel.

Ins. Philippine; Negros Ins., Cuming n. 1795.

Distrib. Assam. Burma.

35. **Carex arridens**, *Hook. f. Fl. Brit. Ind.* vi. (1894) p. 726.

Larut-Perak; alt. 900 metr., Kunstler (hb. King n. 2801).

Distrib. Pegu.

36. **Carex hypsophila**, *Miq.*! *Fl. Nederl. Ind.* iii. (1859) p. 354.

C. tartarea, *Ridley, in Journ. Bot.* xxiii. (London, 1885) pp. 3, 5.

" *C. decoræ* affinis nisi eadem," *Boott,* MS. in Miquelii typo.

Pedunculi ex unicâ bracteâ sæpe plures. Folia breviuscula, 6 mm. lata.

Sumatra; alt. 2750 metr., Forbes n. 2444. Java; hb. Miquel; Gedeb, Usteri n. 101; Buitenzorg, Usteri n. 102.

37. **Carex Havilandi**, sp. nova; foliis elongatis, 5 mm. latis; inflorescentiâ 18-stachyâ, pedunculis 3–4-nim fasciculatis; spicis 3–3½ cm. longis, linearibus, castaneo-rubris, pluribus basi fœmineis apice masculis; utriculis (rostro incluso) 4 mm. longis, gracile lanceolatis, fere glabris; rostro cum ¾ parte utriculi æquilongo, recto conico-lineari.

C. hypsophila, *O. Stapf, in Trans. Linn. Soc.* ser. 2, *Bot.* iv. (1893) p. 246.

Borneo; Kinabalu, alt. 3250 metr., Haviland n. 1403.

38. **Carex turrita**, sp. nova; inflorescentiâ 5 dm. longâ, 40-stachyâ; pedunculo imo (interdum geminato) usque ad 14 cm. exserto, gracili, apice 3–8 spicas approximatas gerente; spicis 5–7 cm. longis, linearibus, pluribus basi fœmineis apice masculis, bruneis, nutantibus; utriculis (rostro incluso) 5 mm. longis, ellipsoideo-lanceolatis, glabris; rostro quam utriculus vix breviore, conico-lineari, scabro.

Ins. Philippine; Benguet, Loher n. 700.

39. **Carex sumatrensis**, sp. nova; planta 7 dm. alta, 25-stachya; foliis 5 mm. latis; pedunculis inferioribus exsertis, interdum fasciculatis; spicis 5 cm. longis, linearibus, pluribus basi fœmineis apice masculis; utriculis rostro incluso 5 mm. longis, anguste ellipsoideis, glabris; rostro cum utriculo æquilongo, conico-lineari, scabro.

Spicæ in apice pedunculi plures approximatæ. Utriculi basi attenuati, conspicue stipitati.

Sumatra; Mons Dempo, alt. 2570 metr., Forbes n. 2388.

40. CAREX BACCANS, *Nees! in Wight, Contrib.* (1834) p. 122; *Franch. in Nouv. Arch. Mus. Par.* viii. (1896) p. 251; *Hook. f. Bot. Mag.* t. 7288, *in Trimen, Fl. Ceylon,* v. pp. 102, 107.

Sumatra; Beccari n. 21. Java; Horsfield, Goering. Cochinchina; Gaudichaud. Tonkin; Balansa n. 2813.

Luzon; Loher nn. 706, 1948.

Distrib. North India. Formosa.

Var. β. *siccifructus,* C. B. Clarke, in Hook. f. Fl. Brit. India, vi. p. 723.

Java; alt. 2000–2500 metr., Koorders.

Distrib. Khasia.

41. CAREX CURVIROSTRIS, *Kunze, Suppl. Schkuhr* (1840–50) p. 79, t. 20.

C. recurvirostris, *Steud. in Zoll. Verz. Ind. Archip.* Heft 2, p. 60; *Cyp.* p. 207.

Java; Zollinger.

42. CAREX TONKINENSIS, *Franch. in Nouv. Arch. Mus. Par.* sér. 3, viii. (1896) p. 251.

Tonkin; Mons Bavi, 900 metr. alt., Balansa n. 2814.

43. CAREX COMPOSITA, *Boott, Carex* i. (1858), p. 3, t. 8.

Java; Buitenzorg, Usteri n. 100.

Distrib. Assam.

44. CAREX BORNEENSIS, sp. nova; culmo 4 dm. longo, 6-stachyo; spicis 2 cm. longis, lineari-lanceolatis, apice masculis basi remote 5–6-utriculigeris, utriculis (rostro incluso) 6 mm. longis, lineari-lanceolatis, glabris; rostro cum ½ parte utriculi æquilongo, lineari, apice inflato scarioso in altero latere fisso.

C. fusiformis, *O. Stapf, in Trans. Linn. Soc.* ser. 2, *Bot.* iv. (1894) p. 246.

Folia 5 mm. lata. Spicæ virides; pars mascula ferruginea.

Borneo; Kinabalu, alt. 3500 metr., Haviland n. 1404.

45. CAREX SPECIOSA, *Kunth, Enum. Pl.* ii. (1837) p. 504.

C. peduncularis, *Wall.* MS., List n. 3391.

C. grammocarpa, *Sprengel* MS. *fide* Miquel.

Borneo; Banjarmassing, Motley n. 1222.

Distrib. From South Madras to Nepaul and Assam, frequent.

46. CAREX LOHERI, sp. nova; culmis 1–3 dm. longis, pertenuibus, 3–1-stachyis; spicis 7–12 mm. longis, ellipsoideis,

apice masculis, basi paucinucigeris; utriculis ellipsoideis, triquetris, undique pilosulis, basi stipitatis, apice in rostrum longiusculum oblongum attenuatis.

Folia 4 mm. lata, in facie inferiore glandulosa. Spicæ virides; apex masculus viridis. Glumæ fœmineæ utriculis breviores, imæ autem apice elongatæ interdum bracteiformes. Utriculi 5–6 mm. longi.

Ins. Philippine; Benguet, Loher nn. 701, 702, 703; Luzon Central, Morong n. 708 bis.

47. Carex madoerensis, sp. nova; culmis 20–25 cm. longis, 3–7-stachyis; spicis omnibus sessilibus, 8–10 mm. longis, apice masculis basi paucinucigeris; utriculis ovalibus, apice angustatis, undique densius pilosis; rostro cum ½ parte utriculi æquilongo.

Folia 5–6 mm. lata. Utriculi 4 mm. longi, fusce virides, basi obpyramidales. Rostri brevis dentes 2 lineari-lanceolati.

Java; ins. Madoera, Zollinger n. 1778 (in herb. Wien).

48. Carex longibracteata, *Steud. in Zoll. Verz. Ind. Archip.* Heft 2 (1854) p. 60, *Cyp.* p. 205; *Miq. Fl. Nederl. Ind.* iii. p. 348, non *Boeck.*

Java; Mt. Waliran, alt. 10,000 feet, Zollinger n. 524 Z.

I have seen no specimen.

Subgenus VI. Propriæ.

49. Carex olivacea, *Boott, in Proc. Linn. Soc.* i. (1846) p. 286; *Carex*, p. 56, t. 149.

C. confertiflora, *Boott, in Mem. Amer. Acad.* n. s. vi. (1859) p. 418, *Carex*, p. 184; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, x. (1898) pp. 75, 98.

Java; Preanger, alt. 1250 metr., Forbes n. 1091.

Distrib. North-east India. Japan.

50. Carex Jackiana, *Boott, in Proc. Linn. Soc.* i. (1846) p. 260, *Carex*, p. 9, t. 25; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, x. (1898) pp. 43, 96.

C. oxyphylla, *Franch.*! *in Nouv. Arch. Mus. Par.* sér. 3, x. (1898) pp. 57, 97.

C. instabilis, *Boott* MS.

Java; Horsfield.

Distrib. Khasia, Yunnan.—Also a var. (*β. minor*) in Ceylon and the Nilgiri Hills.

51. Carex tumida, *Boott, Carex*, i. (1858) p. 66, t. 181.

C. baviensis, *Franch.! in Nouv. Arch. Mus. Par.* sér. 3, x. (1898) pp. 77, 98.

Tonkin; Mt. Bavi, Balansa n. 2825.

Distrib. Sikkim. Khasia. Yunnan.

52. Carex Pseudocyperus, *Linn. Sp. Pl.* ed. 1, p. 987, ed. 2, p. 1387; *Boott, Carex*, p. 140, tt. 451, 452; *Benth. Fl. Austral.* vii. pp. 437, 448; *Kuek. in Engler, Bot. Jahrb.* xxvii. (1899) pp. 549, 563; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, x. (1898) p. 59.

C. fascicularis, *Boott! Carex*, i. (1858) p. 53, pro magnâ parte i. e. t. 139 et t. 140 fig. sinistr.; *Hook. f. Fl. Tasm.* ii. p. 101.

Java; Horsfield (a Boott "*C. fascicularis*" inscripta).

Distrib. Palæarctica (vulgaris). Nearctica. India, Japan (rarior). Australia. Neo-Zeeland (frequens). Mexico.—Var. β. *comosa* is common in North America; varr. γ. *platygluma* et δ. *Haenkeana* are common in South America.

53. Carex breviculmis, *R. Brown, Prodr.* (1810) p. 242; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, ix. (1897) p. 192, x. (1898) p. 95.

C. Royleana, *Nees! in Wight, Contrib.* p. 127; *Boott, Carex*, i. (1858) p. 6, t. 19.

C. leucochlora, *Bunge! in Mém. Sav. Etrang. St. Pétersb.* ii. (1835) p. 142.

C. Langsdorfii, *Boott! in Trans. Linn. Soc.* xx. (1847) p. 144.

C. puberula, *Boott! in Perry, Exped.* ii. (1857) p. 324.

C. discoidea, *Boott! in Mem. Amer. Acad.* vi. (1859) p. 419.

Neo-Guinea; Mt. Scratchley, alt. 3750 metr., MacGregor.

Distrib. Ussuri. Japan. India. China. Australia. New Zealand.

54. Carex Wallichiana, *Nees, in Wight, Contrib.* (1834) p. 129; *Boott, Carex*, i. (1858) p. 16, t. 18; *Franch. in Nouv. Arch. Mus. Par.* sér. 3, x. (1898) pp. 87, 99; *Prescott MS. in Wall. List*, n. 3380 (nomen).

C. hirta, *Boiss. Fl. Orient*, v. p. 431; *Boeck.! in Journ. Linn. Soc., Bot.* xviii. (1881) p. 105, non *Linn.*

Tonkin.

Distrib. Cabul. North India. Yunnan.

[I have seen this plant in a Tonkin collection, but there is no further information in my note.]

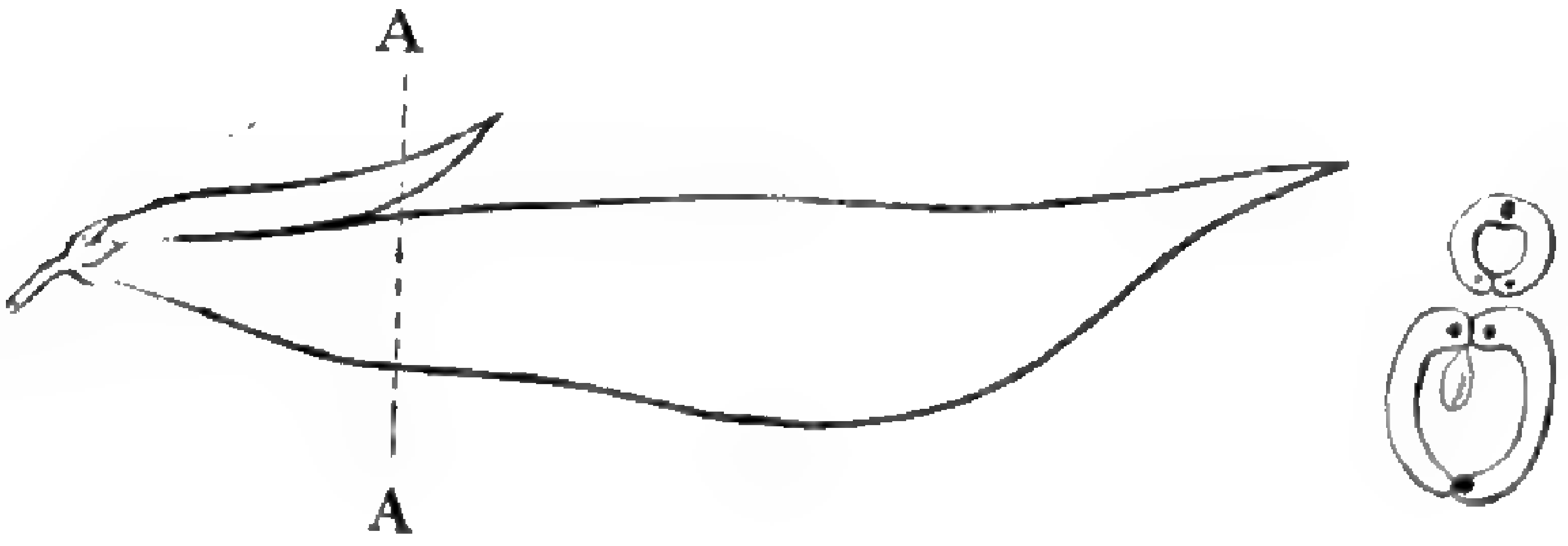
Some Bicarpellary Beans.

By Eric Drabble, D.Sc., F.L.S.

[Read 21st January, 1904.]

During the autumn of 1903 an interesting series of fruits of the French Bean, *Phaseolus vulgaris*, Savi, was obtained from a garden on the clay of the Middle Coal-measures of North Derbyshire. These beans were bicarpellary in nature, but the degree of development attained by the second carpel varied considerably. In the simplest case (fig. 1) it was present merely as a small pod on the posterior aspect of the normal carpel, and adhered to the latter in its lower portion in such a way that a bilocular ovary was formed. The posterior carpel was without seeds.

Fig. 1.



In other cases (figs. 2 & 3) the posterior carpel was more extensively developed, and the basal fusion with its anterior fellow resulted, not, as in the last case, in a bilocular ovary, but in a unilocular one. Distally the two carpels were free from one another.

In the bean shown in fig. 4 the same sort of structure was attained, but the posterior carpel was as large as the anterior one and bore one or more well-formed seeds. The distal extremities of the carpels were free and divaricated widely, recalling somewhat the kind of ovary met with in the Saxifrages.

A particularly striking fruit was that shown in fig. 5. Here the midrib of the posterior carpel was normally developed in the distal region, but more proximally it was greatly reduced, and passed gradually towards one of the lateral sutures of the fruit.

In some cases the midrib became extinct before reaching the lateral suture; in others it fused with the marginal vein of the upper carpel. At the same time the distal quadrangular section of the fruit gave way proximally to a triangular form.

Fig. 2.

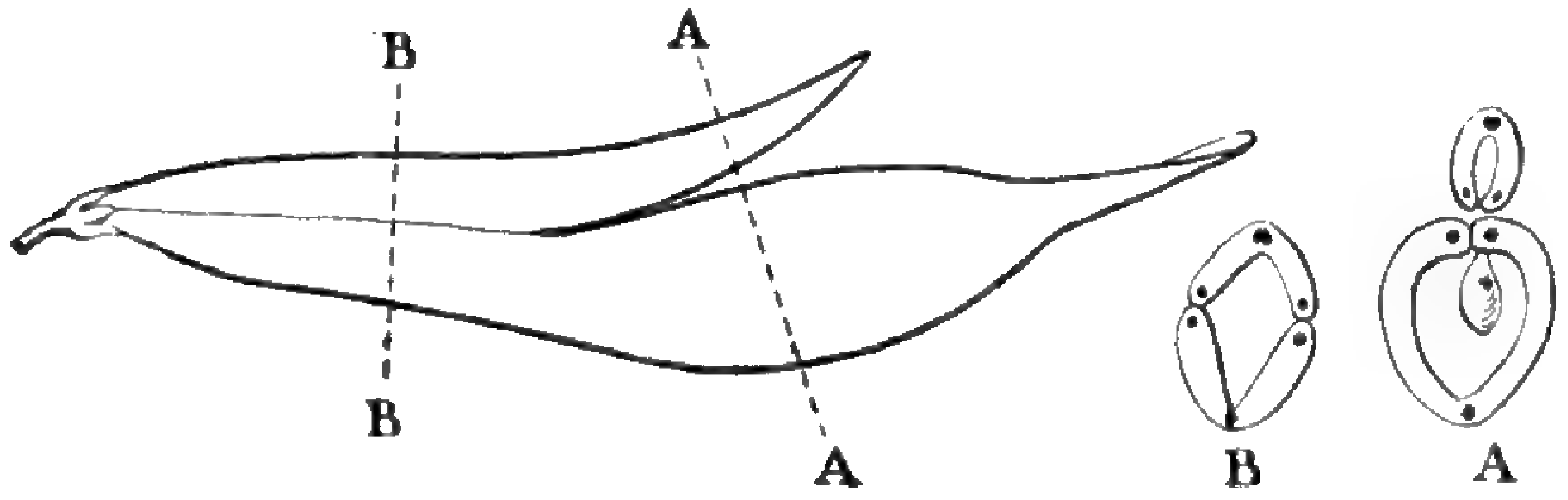


Fig. 3

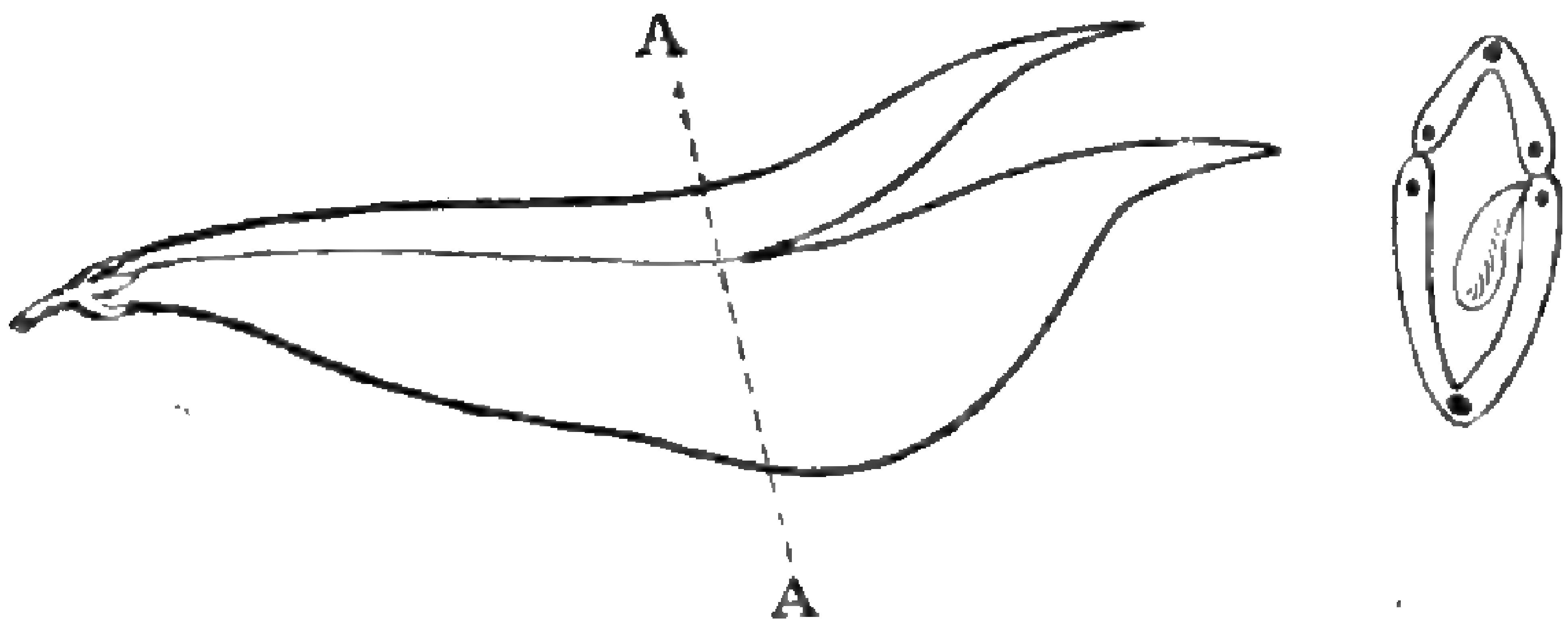
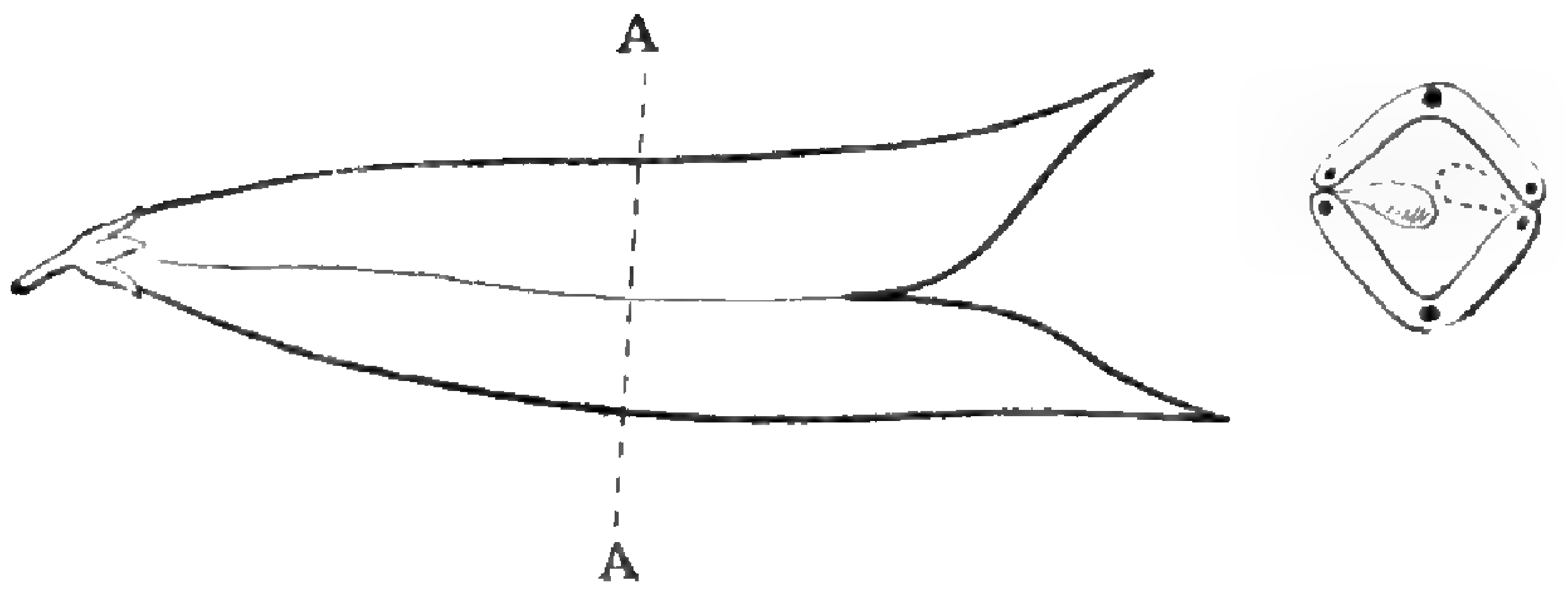


Fig. 4



In these specimens the fusion of the two carpels was nearly complete, only the distal extremities being free.

Finally, a single specimen (fig. 6) was met with exhibiting the triangular cross-section throughout. That we are not here dealing with a tricarpellary fruit, as might at first sight be supposed, is shown not only by the mode of development indicated in the last case, but also by the arrangement of the veins, as figured in fig. 5. Anomalous though it may seem, it is difficult to escape the conviction that we are confronted with a fruit composed of a carpel and a half.

The first notice discovered of bicarpellary fruits of *Phaseolus* was that by Moquin-Tandon (1) in 1841, mention being made of the occurrence of two or even three carpels.

In 1844, Kirschleger (2) described a form much like that shown in fig. 4, ascribing it to "*Phaseolus vulgaris digynus*"; Wydler (4), 1860, and Schlotthauber (8) described double-fruited beans; while Du Hamel (5), in his 'Physiologie des Arbres,' very roughly figures a case similar to that in fig. 4. Schlechtendal (6) describes a case with two carpels fused below and free above, and only one-seeded.

Fig. 5.

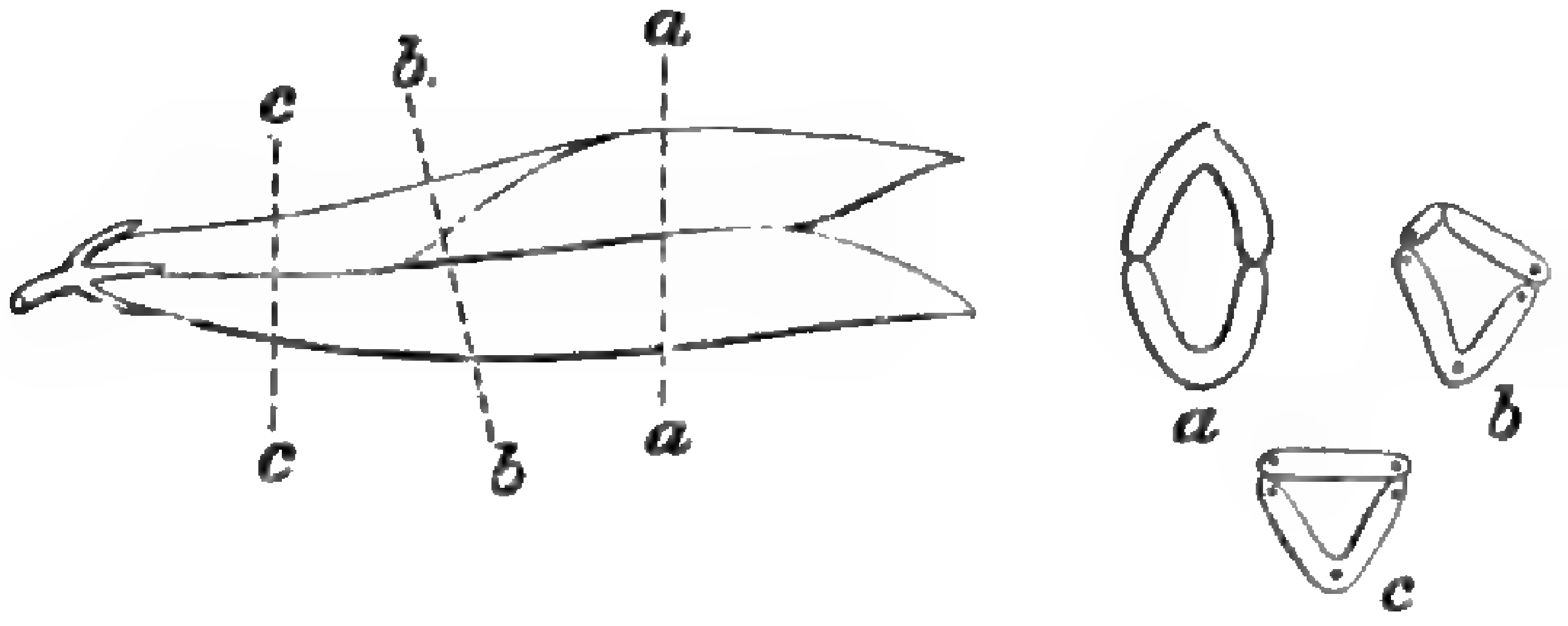
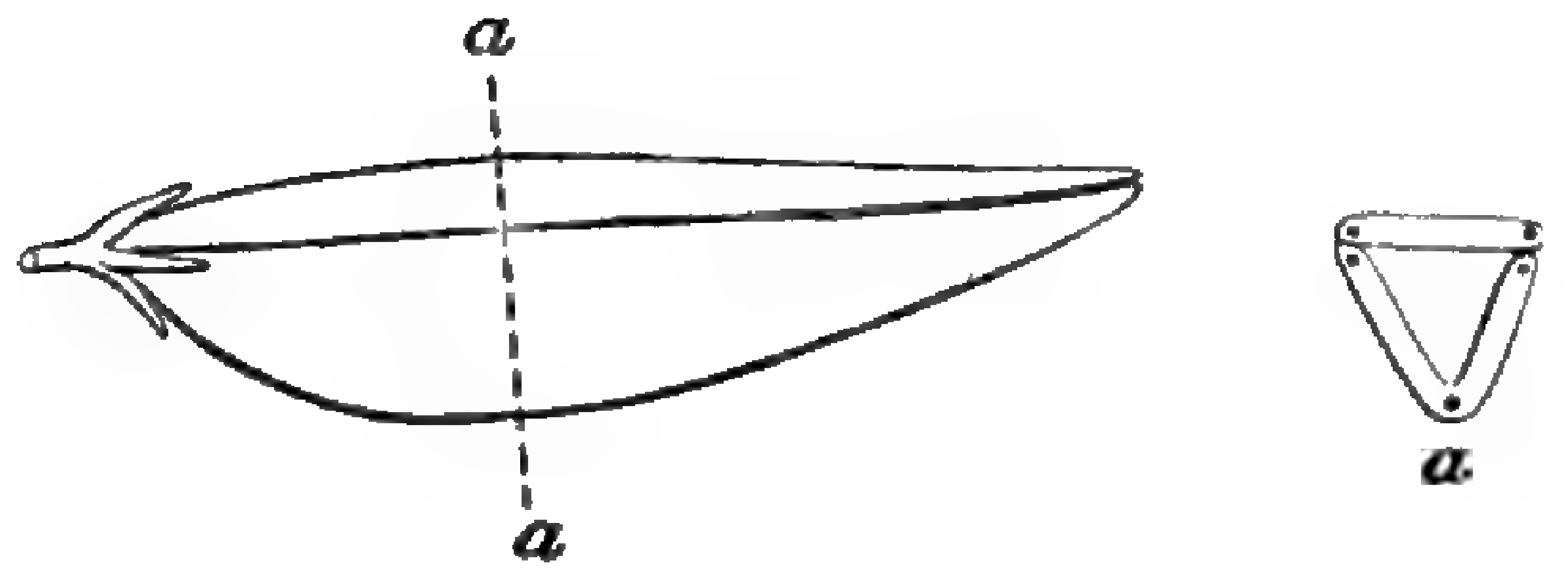


Fig. 6.



Dr. Maxwell Masters (7) in his 'Teratology' gives a list of leguminous plants in which two or more carpels have been found. This list includes representatives of the Mimosoideæ, the Cæsalpinioideæ, and the Papilionoideæ.

Fermond (9) described a form which would appear to closely resemble fig. 6. He says: "Enfin il arrive frequemment que les 2 côtés d'un carpelle (celui qui croît proportionnellement moins que l'autre) sont considérablement écartés à ce point que bientôt ils se trouvent sur un même plan forment avec les 2 côtés de l'autre carpelle un fruit à 3 angles, et à une seule loge." .... "Dans ce cas, les trophospermes sont placés aux 2 angles contigue aux 2 faces du carpelle qui se sont placés dans un même plan; le 3^e angle ne porte point de placenta." He also mentions a tricarpellary condition with a trilocular ovary and axile placentation.

Penzig (**11**), 1890, and Taubert (**12**), 1892, refer to bicarpellary fruits of *Phaseolus*.

An important point was raised by Moquin-Tandon. He says: "Quand ces fruits ont acquis une certaine grosseur, et qu' autour d'eux il ne reste plus de traces des parties florales il devient alors presque impossible de reconnaître s'ils ont été produits par deux ou plusieurs fleurs et par symétrisation."

In the beans figured and described above, there can be no doubt that they arose from a single flower, as the calyx was, in most cases, still present and comprised the usual 5 sepals. In the same way, so far as the calyx is concerned, no indication of any doubling of the flower was apparent.

With reference to the possible meaning of the facts recorded above, but little can be said. There is not much doubt that the Leguminosæ are derived from a polycarpellary stock, and in some degree at least the bicarpellary nature may be regarded as a reversion to an ancestral state. This, however, cannot be said for the syncarpous nature of the ovary. In view of the fact that all the normally polycarpellary members of the order (*Prosopis* sp., *Hausemannia* sp., and others) and most recorded cases of anomalously polycarpellary forms, exclusive of *Phaseolus*, are apocarpous, it is at least open to question whether we have in the forms above described a truly primitive condition. If so, then the series read from 4, through 3, 2, 1, and culminating in the ordinary bean-fruit, may possibly represent the manner of reduction to the present monocarpellary condition. The form shown in fig. 5 would in this case be quite anomalous, as indeed it would appear to be under any conditions.

Although in our present state of knowledge no special importance can be attached to the soil upon which the plants were cultivated, it seemed advisable to place it upon record in the hope that at some future time a coordination of soil and special development may become possible, and it may be suggested that it would in all cases be wise to indicate not only the place but also the geological formation and nature of the soil upon which any teratological specimens may occur.

References.

(1) Moquin-Tandon, C. H. B. A. Élém. Térat. Vég. p. 277 (1841).
(2) Kirschleger, F. Flora, xxvii. 1844, p. 130.
(3) Godron, D. A. Mém. Soc. Sci. Nat. Cherbourg, vol. xvi. p. 35.
(4) Wydler, H. Flora, xliii. 1860, p. 20.
(5) Du Hamel du Monceau, H. L. Physiol. des Arbres, pl. 13. figs. 318, 319.
(6) Schlechtendal, D. F. L. von. Botanische Zeitung, xiii. 1855, p. 823.
(7) Masters, M. T. Teratology, 1879, p. 264.
(8) Schlotthauber, A. F. Bonplandia, viii. 1860, p. 45.
(9) Fermond, V. Essai de Phytomorphie, Paris, vol. i. 1884, p. 168.
(10) Almquist, S. Bot. Centralb. xxix. 1887, p. 93.
(11) Penzig, O. Pflanzenteratologie, Bd. i. p. 402 (1890).
(12) Taubert, P. Leguminosæ in Engler & Prantl, 'Die natürlichen Pflanzenfamilien,' iii. 3, pp. 94–96 (1891).

On the Species of *Impatiens* in the Wallichian Herbarium of the Linnean Society. By Sir J. D. HOOKER, G.C.S.I., F.R.S., F.L.S.

[Read 2nd June, 1904.]

THE species of *Impatiens* in the Wallichian Herbarium, consisting almost exclusively of those collected by Wallich or his *employés* in Nepal and Silhet, together with those of the missionaries in Malabar, made during the latter half of the 18th and beginning of the 19th centuries, represent nearly all that was known of the Indian Balsams at the date of the distribution of that Herbarium. They amount to 48 ticketed species (Nos. 4729–4775 & 7274, 7275), of which 18 are from Malabar, as many from Nepal, 10 from Silhet, 6 from Burma (including Rangoon and Tavoy), and 2 from Sirmore. Though comparatively few in number, for the genus is now known to contain upwards of 200 British Indian species, they foreshadow the remarkable fact of a segregation of these in the several phytogeographical regions of India in which they occur *, which has no parallel in any other large genus of plants known to me.

* Of the 200 British Indian species (many of them as yet unpublished) there are, in the Kew Herbarium, approximately 23 from the Himalaya west of Nepal, 63 from the Eastern Himalaya (inclusive of the Valley of Katmandu in Central Nepal), 52 from Burma (inclusive of Assam and Silhet), 58 from Malabar, and 21 from Ceylon. Of the 23 West Himalayan species only 11 have been found in the Eastern Himalaya, of which 8 alone enter Sikkim. In other terms, of nearly 80 Himalayan species only about one-tenth are known to be common to both sections of the range, a proportion which will be greatly reduced when the unexplored ranges East of Sikkim are botanized. Of the 52 Burman species only 10 have been found in the Eastern Himalaya. The 7 Malayan Peninsular species are absent elsewhere in India. Of the 58 Malabar species only *I. Balsamina*, L., *oppositifolia*, L., and *chinensis*, L., are found elsewhere in British India; only 8 of the 58 inhabit Ceylon.

This segregation of species extends in a marked degree to that of the two great divisions of the genus, namely those species with capsules turgid in the middle, and those with capsules linear or clavate. Every Malabar and Ceylon species belongs to the first of these divisions; every Western Himalayan (except *I. Balsamina*) to the second. Of the Eastern Himalayan the great majority belong to the second; of the Burman the great majority belong to the first, as do all the Malay Peninsular. I have little doubt that when the Himalayan ranges East of Sikkim and the mountain regions of Burma come to be explored botanically, the number of British Indian species will approach 300.

Thus, of all the species contained in the Wallichian Herbarium, only one, *I. Balsamina*, L., is common to the five of the regions indicated in the note on the preceding page, namely, Eastern Himalayan, Western Himalayan, Burmese, Malabarian, Ceylonese and Malayan Peninsular. Of the 18 Malabarian 3 only were found in other regions: namely, *I. Balsamina*, L., in four others; *I. chinensis*, L., in two; and *I. oppositifolia*, L., in one, Burma. Of the 18 Nepal species, two alone were collected in the adjoining region to the westward. Of the 10 Silhet species, two alone are Malabarian.

The consultation of the Wallichian collection of Balsams presents great difficulties which it is the object of this communication to alleviate. In many cases two or more species are fastened down under one number and name; and in not a few cases one species occurs under several numbers. This is partly due to the great difficulty in distinguishing badly preserved mounted specimens of a puzzling genus without moistening and removing flowers of the most delicate consistency and making a microscopical examination of their organs; but a far more serious source of confusion is one the origin of which can only be conjectured: namely, that a part of the collection which, after being sorted for mounting (by Bentham, who appears to have ticketed the species), and transferred to the Society's custody, had either fallen from the hands of a custodian or been swept off a table, and the scattered specimens and tickets had been dealt with in a haphazard way by an ignorant mounter *. It seems to me impossible otherwise to explain the occurrence upon one sheet, under one number (4730), of four species so totally dissimilar in habit, foliage, inflorescence, and flowers as *I. racemosa*, DC., *I. bicornuta*, Wall., *I. tingens*, Edgew., and *I. odorata*, D. Don; or of such three under No. 4729 as *I. bicornuta*, Wall., *I. bicolor*, Royle, and *I. sulcata*, Wall.; or the mounting side by side under No. 4770 excellent individuals of *I. leptoceras*, Wall., and *I. Balsamina*, L., which have no resemblance.

Further sources of difficulty are the misplacement of MSS. tickets, other than the lithographed numbered ones, that are attached by pins to the sheets of the species to which they belonged or were supposed to belong, the minuteness of the flower of some species, and the absence of fruit of others. Taking all sources of difficulty into account, the following summary of their effects is, I hope, approximately correct:—

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* There is no other instance known to me in the Wallichian Herbarium of a similar confusion of specimens and tickets.

Cases of two or more species occurring under one number: 5 species in 1 case; 4 species in 1 case; 3 species in 2 cases; 2 species in 10 cases.

Cases of single species occurring under two or more numbers: 1 species under 7 numbers; 2 under 3 numbers; 10 under 2 numbers.

ENUMERATION OF SPECIES, WITH OBSERVATIONS.

No. 4729. "IMPATIENS LONGICORNU, *Wall.* Napalia 1821." One sheet with three species.

On the right *I. bicornuta*, Wall. See also 4730, 4765.

On the left *I. bicolor*, Royle* (I. umbrosa, *Edgew.*).

In the middle *I. sulcata*, Wall. (I. gigantea, *Edgew.*). See also 4764.

No. 4730. "IMPATIENS RACEMOSA, *DC.* Napalia 1821." Three sheets with five species.

Sheet 1. On the left *I. tingens*, Edgew.† On the right *I. bicornuta*, Wall. See also 4729, 4765.

Sheet 2. On the upper right hand *I. bicornuta*, Wall. On the left *I. racemosa*, DC.

On the lower right hand *I. racemosa*, DC. On the lower left *I. odorata*, D. Don.

Sheet 3. "No. 4730 B. Sillet, W. G." *I. Balsamina*, L., with double flowers. See also 4731, 4770.

No. 4731. "IMPATIENS BALSAMINA, *Linn.* H. R. C." With double flowers. See also 4730 B, 4770.

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* The name *I. bicolor*, Royle, placed in the 'Flora of British India as a synonym under *I. umbrosa*, Edgew., must I think be retained, though the description and plate in the 'Botany of the Himalaya' do not suffice to distinguish it from several others. It is the commonest species in the Western Himalaya.

† This being the dominant specimen of those ticketed *I. racemosa*, DC., by Wallich, I took it for that plant and reduced *I. tingens* to a synonym in the 'Flora of British India.' From information kindly supplied by M. Casimir de Candolle, I find that I erred in doing so.

No. 4732. "IMPATIENS COCCINEA, *Sims.*" = *I. Balsamina*, L.—Both A and B are of var. *rosea*, Hook. f., = *I. rosea*, Lindl. See also 4730 B, 4731, 4733, 4734, 4735, 4770.

A. "Napalia" with MS. ticket "*Impatiens glandulifera*, Wall., an I. Balsamina, L., spontanea? Thaukote, Aug. 1821."

B. "Sirmore, G. Govan, M.D."

No. 4733. "IMPATIENS CORNUTA, *Linn.*" = *I. Balsamina*, L. See above.

A. "I. cornuta, *Herb. Wight.*"

B. "I. cornuta, *Heyne.*"

C. "I. Tiramira et I. Lacca, *H. Ham.* Nathpur."

D. "Ripa Irawaddi, 1826."

No. 4734. "IMP. LONGIFOLIA, *Benth.* Hb. Wight." = *I. Balsamina*, L. See above.

No. 4735. "IMP. ARCUATA, *Benth.* Imp. sinensis, Hb. Madr. Mysore." = *I. Balsamina*, L., var.

No. 4736. "IMP. SCABRIUSCULA, *H. Heyne.*" Two species.

Upper right and left and lower right hand specimens, *I. scabriuscula*, with MS. ticket "*Impatiens ramosa*, 23rd Sept. [18]16," and in another hand "*scabriuscula.*"

Lower left hand, *I. pendula*, H. Heyne. See also 4744.

No. 4737. "IMP. LATIFOLIA, *Linn.*" One sheet with two species.

A. "Imp. latifolia, *Hb. Madr.* e Travancore."

B. "Imp. latifolia, *Hb. Wight.*" = *I. lucida*, H. Heyne. See also 4738.

No. 4738. "IMP. LUCIDA, *Hb. Heyne.*" With MS. ticket "*Impatiens lucida*, Courtallum, ab amicissimo Heyne." See also 4737.

No. 4739. "IMPATIENS LESCHENAULTII, *De Cand.* Hb. Wight." Two species.

A. *I. Leschenaultii*, DC.

B. Nilghiry dom. Noton, with MS. ticket "Impatiens, Noton. Neilghery, a small branch." = *I. latifolia*, L. See 4737.

No. 4740. "IMPATIENS HISPIDULA, *Benth.* Napalia 1821." = *I. puberula*, DC. See also 4767.

No. 4741. "IMPATIENS INCONSPICUA, *Benth.* Hb. Heyne." See also 4743.

No. 4742. "IMPATIENS MULTIFLORA, *Benth.* Pundua Mont. De Silva." = *I. tripetala*, Roxb. See also 4752.

No. 4743. "IMPATIENS MYSORENSIS, *Roth.*" Four species.

A. "I. oppositifolia, *Hb. Madr.*" The upper specimen, on the left, with MS. ticket "I. oppositifolia, e Kuttalam, ab amicissimo Mitchell," is true *I. oppositifolia*, Wall., with a scrap of *I. Kleinii*. See also 4746.

B. "I. oppositifolia, *Hb. Wight*, etiam I. rosmarinifolia Dec. e Courtall." The three specimens on the right of the sheet, with the MS. ticket "Balsamina Rosmarinifolia, DC., Courtallum, 2 Feb. 1827, in moist places amongst long grasses," = *I. inconspicua*, Benth.

C. "Impatiens mysurensis, *Hb. Wight*," consists of fragments in the lower left hand corner of the sheet to which a MS. ticket applies (though attached to a specimen of *I. oppositifolia*), bearing the inscription in Rottler's handwriting: "Impatiens Maysorensis, *nob.* Pedunc. 1-floris, axillarib. solitariis binisq. Fol. altern. ovato-lanceolat. serratis." This is the true *I. mysorensis*, Rottl.

No. 4744. "IMPATIENS PENDULA, *Hb. Heyne*," with MS. ticket of Heyne. "Impatiens pendula. Pedunc. uniflor. axill. s. lateral. post anthesin reflexis. Fol. altern. ad basin attenuat. margine mucronatis. 22d Sept. [18]16." See also 4736.

No. 4745. "IMPATIENS PUSILLA, *Hb. Heyn.*" = *I. inconspicua*, Benth. See also 4741 & 4743.

No. 4746. "IMPATIENS TENELLA, *Herb. Heyn.*" Two species; two upper specimens and right hand lower with MS. ticket of Heyne. "Impatiens sp. longiflora. Pedunc. solitar. axill. longissim. Folia opp. oblonga, serraturis cuspidat. 22d Sept. [18]16."

B. "Impatiens fasciculata? *Hb. Madr.* Travancore." Lower left hand specimen = *I. Kleinii*, Wight & Arn. See also 4743.

No. 4747. "I. RUFESCENS, *Benth.* Herb. Wight." = *I. tomentosa*, Heyne, non Wall. Cat.

No. 4748. I. HETEROPHYLLA, *Wall.* Two sheets, two species.

A. "Sillet, De Silva & H. B." = *I. chinensis*, L. See also 4749.

B. "Taong Dong, 1826." Upper right and left hand specimens to which the MS. ticket "*Balsamina amœna*, Wall.," belongs.

The three other specimens = *I. diversifolia*, Herb. Heyne. See 4749.

No. 4749. IMPATIENS DIVERSIFOLIA, *Hb. Heyne.* Two sheets, two species.

B. "Impatiens malabarica, *Hb. Madr.*" with one specimen (the middle lower) of *I. chinensis*, L., and MS. tickets "Impatiens fasciculata prox. Cuttalam, Sept. 1814," and "Impatiens sp. malabarica, *mihi.* Caul. debilis basi "repens. Fol. opposita cordato-lanceolata acuta serrata "serraturis mucronatis inferiore glauca. Pedunc. uni-"floris aggregatis nectariis florum parum longioribus. "Quilon, Oct. 1814." The *mihi* I suppose to be Klein.

C. "Herb. Wight."

No. 4750. "IMPATIENS RETICULATA, *Wall.* Rangoon 1826." = *I. oppositifolia*, L. See also 4743, 4751.

No. 4751. "IMPATIENS TOMENTOSA, *Herb. Heyne,*" = *I. oppositifolia*, L. See above. This is an obvious misplacement of a ticket. The plant, of which there are two specimens on the sheet, is perfectly glabrous in all its parts. Two MS. tickets are attached to the sheet, one inscribed "Impatiens tomentosa capsulis totis tomentosis"; the other "Impatiens fasciculata, aurant. ad pedem mont Bauvaputa."

No. 4752. IMPATIENS TRIPETALA, *Roxb.* Three sheets.

A. "Sillet," F. D. B. "I. ternifolia, *H. Ham.,*" with Hamilton's ticket "Gualpara, 8th May, 1808." C. "H. B. C."

No. 4753. IMPATIENS LÆVIGATA, *Wall.* Sillet, F. D. Two sheets. B. "H. B. C. e Sillet."

No. 4754. "IMPATIENS ACUMINATA, *Benth.*" Sillet, H. B.

No. 4755. "IMPATIENS NATANS, *Willd.* Hb. Wight." = *Hydrocera triflora*, W. & A. See also 4756.

No. 4756. "IMPATIENS TRIFLORA, *Willd.*" Three sheets. = *Hydrocera triflora*, W. & A., 4755.

A. "I. triflora, *Hb. Madr.*" B. Sillet, De Silva. C. Ripa Attran, 1827.

No. 4757. "IMPATIENS UMBELLATA, *H. Heyn.,*" with MS. ticket "Impatiens formosissima, 1st Aug. [18]18."

No. 4758. "IMPATIENS SCAPIFLORA, *Herb. Heyne.*"

B. "Impatiens cordifolia, *Hb. Madras,*" with MS. ticket "Impatiens sp. n. cordifolia, mihi. Pedunculis multiflor. e Kuttalam apportat. ab. amiciss. D. Mitchil."

No. 4759. "IMPATIENS GRANDIS, *H. Heyne.*"

B. Impatiens grandiflora, *Herb. Madr.*, with MS. ticket "In montosis prope Cuttalam, Sept. 1818."

No. 4760. "I. BRACTEATA, *Coleb.* Mont Silhet, F. D. & H. B.," with MS. name *I. trichocephala*, Wall.

No. 4760 in pencil; error for 4766 *q. v.*

No. 4761. "IMPATIENS JURPIA, *H. Ham.* e Morung." Two sheets.

B. Sillet, F. D.

No. 4762. "IMP. FRUTICOSA, *Lesch.* Nilghery, Leschenault de Latour."

No. 4763. "IMPATIENS RADICANS, *Benth.* Sillet, F. D." Two sheets. Two species.

B? "Mt. Sillet, F. D. & W. G." = *trilobata*, Coleb.

No. 4764. "IMPATIENS SULCATA, *Wall.*" Two sheets. Two species. Specimens very bad and identification doubtful.

A. Napalia 1821. Right hand specimen *I. Royleana*, Walp.; left hand *I. sulcata*, Wall. See also 4729.

B. "Sirmore, Dr. Govan." Upper specimen *I. Roylei*, Walp.; two specimens *I. sulcata*, Wall. ? See also 4729.

No. 4765. "IMPATIENS BICORNUTA, Wall. Napalia 1821." Two sheets. See also 4729, 4730.

No. 4766. "IMP. INSIGNIS, DC. Napaulia 1821," on blank sheet. See 4760 in pencil.

No. 4767. "IMPAT. DISCOLOR, *De Cand.* Napaulia 1821." Three sheets. Three species.

Sheet 1. *I. discolor*, DC., four specimens. *I. Wallichii*, Hook. f., two specimens.

Sheet 2. *I. discolor*, DC., one specimen. *I. Wallichii*, Hook. f., two specimens.

Sheet 3. *I. puberula*, DC., with MS. name *I. mollis*, Wall. See also 4740.

No. 4768. "IMPAT. URTICIFOLIA, *Wall.* Gossain Than."

No. 4769. "IMPAT. SCABRIDA, *DC.*" Two sheets.

A. Napaulia 1821, with two MS. tickets "Impatiens punctata, *Wall.*," and "I. calycina, *Wall.*," both inscribed "Chandagiri, Aug. 1821."

B. "Sirmore, Dr. Govan."

No. 4770. "IMPATIENS LEPTOCERAS, *DeC.* Napaulia 1821." Three sheets. Two species.

Sheet 1. *I. leptoceras*, DC.

Sheet 2. Right hand specimen *I. leptoceras*, DC.; left hand *I. Balsamina*, L.

Sheet 3. *I. Balsamina*, L.

No. 4771. "IMP. SERRATA, *Benth.* Napalia 1821."

No. 4772. "IMP. CIRCÆOIDES, *Wall.*" Two species.

A. Rangoon 1826.

B. Prome 1826.

There are four specimens of two species on the sheet; the two upper with a simple stem, marked *a* in pencil, no doubt belong to an adjoining MS. ticket inscribed "I. simplex, *Wall.*, Prome, Nov. 1826." The two lower are of a very different and much branched species, in an undeterminable condition, with a ticket inscribed "I. circæoides, *Wall.*, Legi ad fossas coet. prope Rangoon, Aug. 1826"; it has no resemblance to a *Circæa.* From the above, it would appear that the A of the lithographed ticket is the Prome plant, and B, the Rangoon, an unnamed one. There are specimens of the Prome plant in the Herb. Kew from Moulmain.

No. 4773. "IMP. TAVOYANA, *Benth.* Tavoy, W. Gomez."

No. 7274. "IMPATIENS RACEMULOSA, *Wall.* Silhet, Gomez."

No. 7275. "IMPATIENS PORRECTA, *Wall.* Silhet, Gomez."

An additional Nepal species of *Impatiens* collected by Wallich in 1821 was found by me when examining some bundles of specimens which remained in the rooms of the Linnean Society after the completion of the great distribution in 1831? It is an undescribed species, for which I propose the name of *I. prætermissa* *. In the same bundle I found a form of *I. bicolor*, Royle (I. umbrosa, *Edgew.*), or of an undescribed species, with the MS.

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* *I. prætermissa*; herbacea, ramulis foliisque immaturis puberulis, foliis 1–1½ poll. longis alternis ovatis ovato-lanceolatisve acuminatis serratis basi rotundatis v. in petiolum brevem angustatis, glandulis stipularibus pulvinatis, pedunculis axillaribus gracilibus foliis multo brevioribus furcatis 2-floris pubescentibus, basi et ad furcam ebracteatis, pedicellis pedunculo longioribus medio bracteatis, bracteis lanceolatis, floribus mediocribus, sepalis 2 amplis oblique oblatis membranaceis aristatis, vexillo erecto orbiculari costa medio dorso longe cornuta, alarum lobo basali antice rotundato basi cuneato, lobo distali paulo longiore anguste dolabriformi, labio cum calcare incluso 1–1½ poll. longo late infundibulari in calcar gracile attenuato, capsula pollicaris linearis acuminata, seminibus subglobosis $\frac{1}{10}$ poll. diam. subrugulosis.

Belongs to a section of the genus with *I. scabrida*, DC., and others, including the European and North American ones, in which the ebracteate peduncle is forked and the bracts usually placed on the pedicels above their middle, not at their base.

ticket of "I. longicornu, *Wall.*, no. 4729," which differs from the ordinary form of *I. bicolor* in the leaves being serrulate and the flowers much smaller. In the type collection, No. 4729 *Impatiens longicornu*, Wall., is represented by three species, *I. bicolor*, Royle, *I. bicornuta*, Wall., and *I. sulcata*, Wall., all of which are remarkable for the shortness of their spurs. The true *I. longicornu*, Wall., in Roxb. Fl. Ind. Ed. Carey is *I. leptoceras*, DC., and *longicornu* hence disappears.

The two above-mentioned plants I have placed in the cover with Nos. 7274–5 of the Wallichian Herbarium.

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,, ,, Silhet and Malabar, 4 (I. Balsamina, chinensis, natans, *i. e.* Hydrocera triflora).
,, ,, Nepal and Sirmore, 2 (I. Balsamina, scabrida).
,, ,, Morung and Silhet, 1 (I. Jurpia, *Ham.*).

On the Blaze-Currents of Vegetable Tissues: a Week's Holiday with a Galvanometer and some Plants. By A. D. WALLER, M.D., F.R.S. (Communicated by Prof. J. B. FARMER, F.R.S., F.L.S.)

[Read 16th June, 1904.]

§ 1. FIRST DAY.—I set up the galvanometer and keyboard in a convenient corner of the room, and verify the circuit.

The two unpolarizable electrodes A and B and the galvanometer are connected with the central keyboard in such a way that current from B to A through an interposed object shall give deflection of the galvanometer-spot to my right, which I call the "positive" direction.

The compensator and the induction-coil are likewise connected with the central keyboard, with a reverser in each of these two circuits, so disposed that its position towards the right and left indicates "positive" and "negative" directions of current. For the induction-coil, this convention is made to apply to the break current. Its reverser is placed in the primary circuit, and the latter also includes a double-contact key; so that we may take at will either single currents or alternating (tetanising) currents. The direction of the latter is indicated by the position of the reverser; if it is, *e. g.*, tilted to the right, we know—or can at once verify—that the break current passes through the object under examination in the "positive" direction from B to A.

Finally, I verify the conventional "positive" and "negative" directions between B and A by touching B with a bit of zinc, A with a finger of the other hand; when the galvanometer-spot flies off to my right.

§ 2. The galvanometer, being in a strange place, must now be calibrated by means of the compensator. Here are the calibration-numbers taken at the outset of the present observations:—

August 4th.—Galvanometer of 7000 ω R.

Compensator.		*Deflection.*	
−0·001	+0·001	− 3 cm.	+ 3 cm.
−0·002	+0·002	− 6 "	+ 6 "
−0·003	+0·003	− 9 "	+ 9 "
−0·004	+0·004	−12 "	+12 "
−0·005	+0·005	−15 "	+15 "

$$\frac{\text{Swing}}{\text{Steady Deflection}} = \frac{3}{2}.$$

One double oscillation = 7 secs.

Quite at rest in 30 secs., after 4 double oscillations.

The instrument is now sufficiently adjusted for our purposes; the fact that it is not very sensitive (1 cm. deflection indicating rather less than 10^{-7} ampère) is an advantage under our present circumstances.

A photograph of the Laboratory corner as it stands at the end of the first day shows the apparatus unpacked and set up ready for use (fig. 1, p. 34).

A diagram of the circuit is seen to the right; the apparatus itself—galvanometer, scale, shunt, electrode-holder A B, cells, compensator, coil, reversers, keys, and, in the foreground, the keyboard—is arranged on the packing-case, and is not much more bulky or troublesome to pack and unpack than a dressing-bag. As a travelling *nécessaire,* I regard it as quite indispensable; and it serves to demonstrate that electro-physiology can be studied elsewhere than in beautifully-arranged Institutes of Physiology.

I have often described the use of the various parts of the apparatus; and we shall see in the next few days what can be done with it. I shall not now redescribe it; all I shall do will be to say that the photograph exhibits two additional pieces on the travelling-box, to the right and left of the electrode-holder (which are not represented in the diagram), and to make a remark intended to guard against any misunderstanding as to the "voltage" of physiological currents.

Fig. 1.—Photograph of the apparatus unpacked from its box and set up for the purposes of a seaside holiday: in the present instance for the comparison of sea-plants with land-plants. The diagram in the right-hand corner gives a ground-plan of the apparatus arranged on the table below. It is reproduced of legible size in fig. 2.

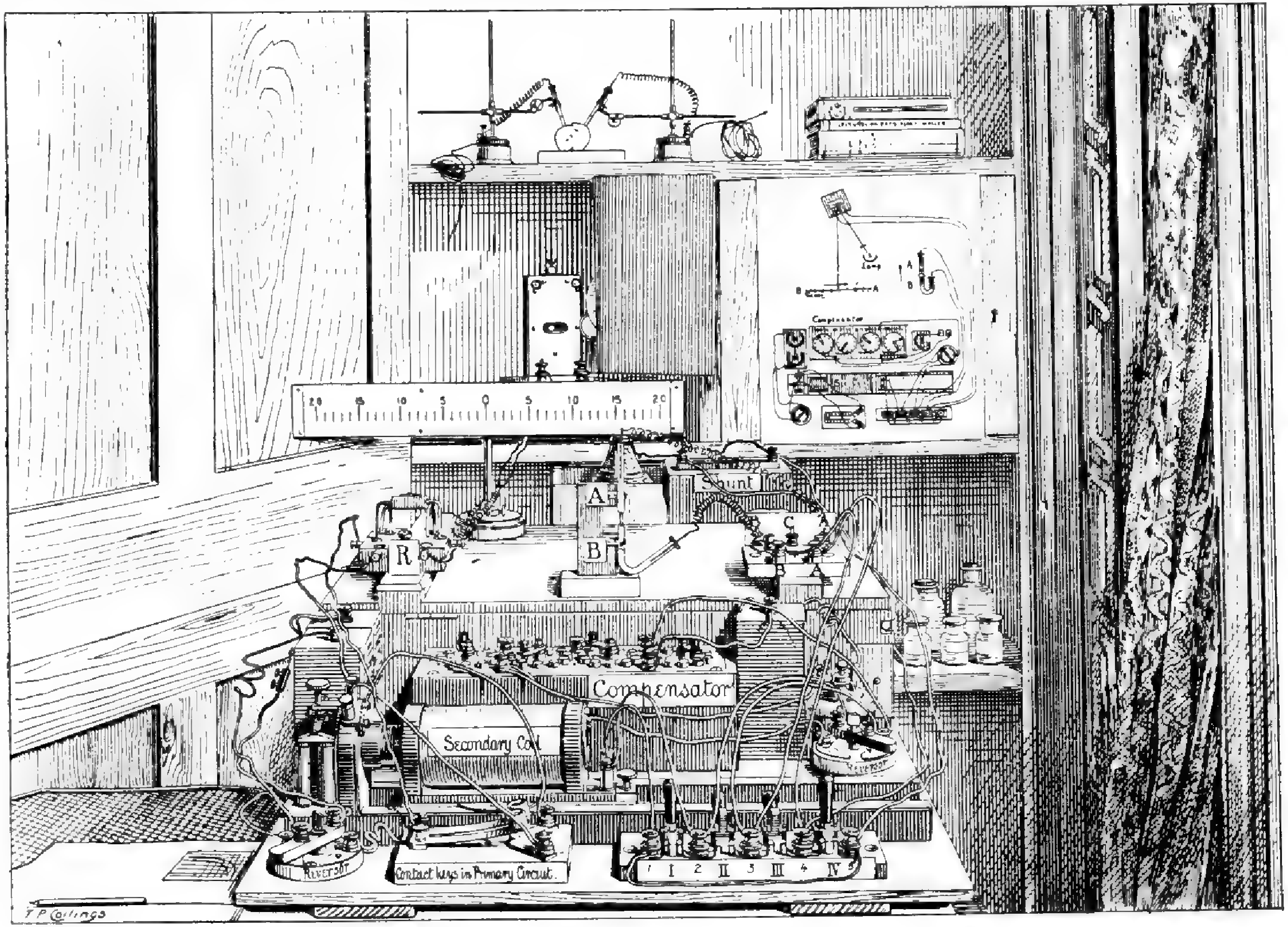
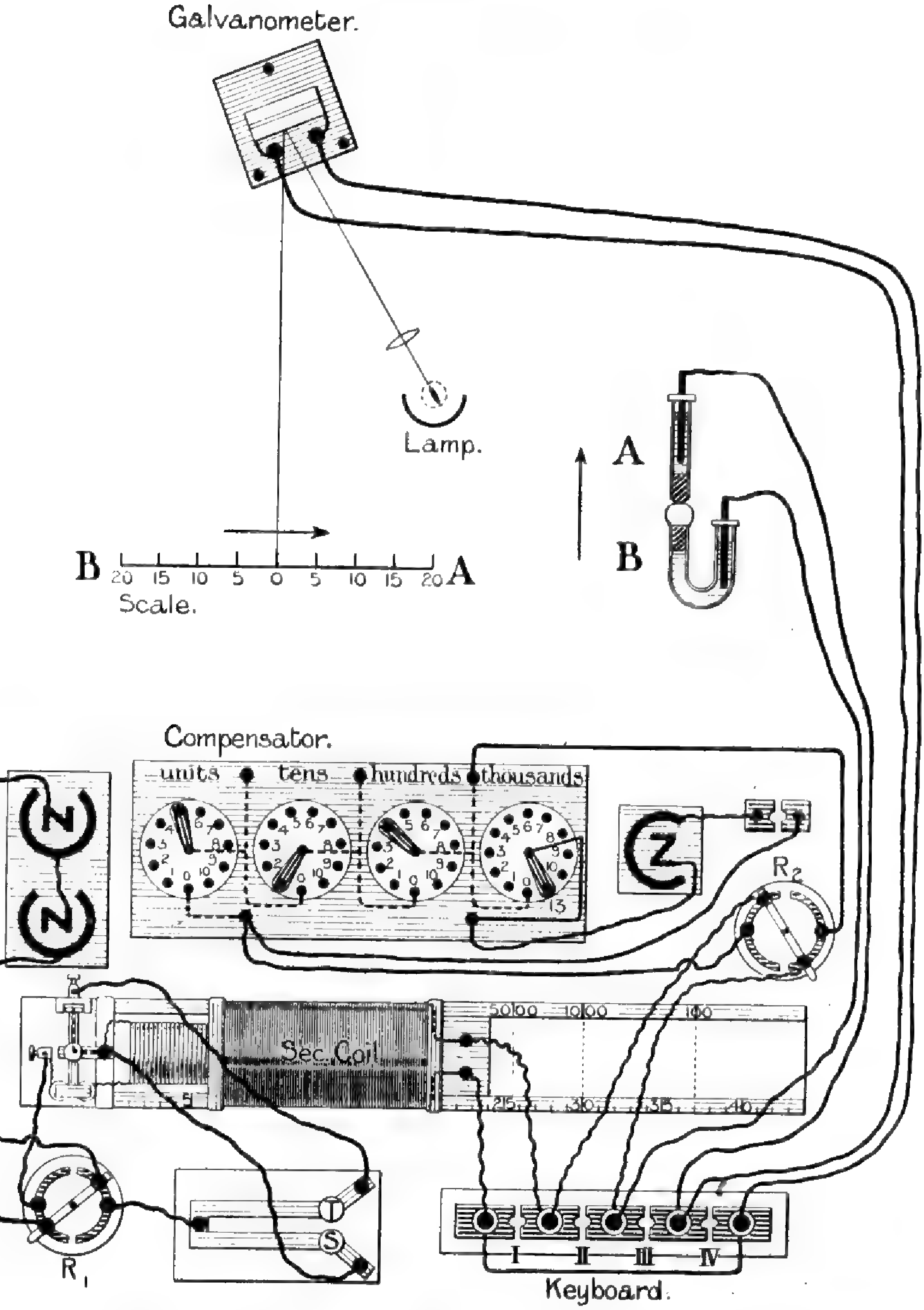

20 15 10 5 0 5 10 15 20
A
B
C
R
Shunt
Compensator
Secondary Coil
Reverser
Reverser
Contact keys in Primary Circuit.
1 I 2 II 3 III 4 IV 5
T P Collings

Fig. 2.


Galvanometer.
Lamp.
A
B
B
20 15 10 5 0 5 10 15 20
A
Scale.
Compensator.
units
tens
hundreds
thousands
R₂
Sec. Coil
5000
1000
100
25
30
35
40
T
S
R₁
I
II
III
IV
Keyboard.

The plant is placed between the *Electrodes*, A, B. Excitation is delivered to it from the Sec. Coil *via* the *Keyboard*; the direction of *excitation* is determined by the Reverser R_1 in the primary circuit. The Key S T in that circuit serves to deliver single or tetanising currents. The *Compensator* serves to counterbalance any incidental plant-current and to standardise the deflection; the direction of its current is determined by the Reverser R_2. The *Galvanometer*, by the movements of a spot of light on the transparent scale, indicates the direction of exciting current or currents, and the direction and magnitude of the responsive or blaze-currents.

§ 3. Of the additional pieces of apparatus just referred to, the first (marked R) is for the purpose of letting a blaze-current into the galvanometer-circuit at a short and regular interval after excitation by a break induction-shock.

The other (marked B A C) is for the purpose of taking the separate post-anodic or post-kathodic effects at A or at B, after excitation through A and B. By a movement of the switch, contact at one or other of these excited points is replaced by a contact C with an indifferent point.

§ 4. The purpose of a standardising deflection is two-fold :—

A deflection taken before and after experiment serves to show whether the resistance has altered, and how much.

The currents observed in different experiments are, to some extent, brought to a common denominator when they have been referred to and expressed in terms of a standard voltage.

I say "to some extent," for it is evident that a reduction to zero by a compensating current, or a comparison of a blaze deflection with a standardising deflection, can never give us the true electromotive value of our physiological currents. We do not know how much of our mass is actually active, nor in what proportion the mass offers a shunt to the galvanometer.

Nevertheless, with this distinct understanding, that a denomination by voltage does not signify that we have measured a physiological voltage, it is evidently better to specify effects in terms of voltage than in terms of current.

§ 5. SECOND DAY.—The first object I have in view is to compare land-plants with sea-plants as to their blaze-currents ; so I visit the garden to select some convenient land-vegetable from which to obtain a constant supply of fresh material : c'est l'embarras du choix ; finally I select peas as my principal vegetable, although I foresee that it will be quite impossible to remain attached to peas alone.

§ 6. I visit the sea-shore at low tide, to select some convenient sea-vegetable from which to obtain a constant supply of fresh material : the choice is not so various. Finally I select a seaweed, the name of which I do not know, but which exists in luxuriant abundance attached to the rocks at half-tide, and is characterised by quantities of olive-shaped ovaries, somewhat like pea-pods. They will therefore afford a quite satisfactory term of comparison with my land-peas. I call them sea-grapes for the present *.

§ 7. *First Pair of Experiments.*—The half-ripe pod of a "land-pea" (*Pisum sativum*) is placed symmetrically between the electrodes A B, to be submitted to the blaze test. Its accidental current is compensated.

A break induction-shock in the positive direction, from B to A, is followed by a blaze-current off-scale in that same positive direction.

A break induction-shock in the negative direction, from A to B, is followed by a blaze-current off-scale in that same negative direction.

In both cases the blaze-current has been *homodrome* with the exciting current; it has been of quite considerable magnitude, "off-scale" signifying in this case "greater than 0·02 volt"; it was completely abolished after immersion of the pod in hot water.

		Deflection.
0·001	volt through galvanometer	4·0
0·001	,, ,, ,, +electrodes	3·0
0·001	,, ,, ,, ,, +pea-pod	0·9
0·001	The same after the double blaze	1·5
	The same after tetanisation	1·7
	The same ½ hour later	1·2

§ 8. A "sea-grape" is placed symmetrically between the same pair of electrodes A B, to be submitted to the blaze test. Its accidental current is compensated.

Break induction-shocks in the positive and in the negative directions do not arouse any blaze-current. The conductivity of the pod is not appreciably altered by the induction-shocks nor by strong tetanisation.

§ 9. *Commentary.*—This first pair of experiments, which were several times repeated with precisely similar results, show in the clearest possible manner a remarkable contrast between a land-plant and a sea-plant. And obviously the next step will be to test other land- and sea-plants for this contrast, and learn whether it is justifiable to say that land-plants give blaze-currents, but sea-plants do not.

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* Prof. Farmer has informed me since that they were probably *Ascophyllum*.

§ 10. From a second visit to the garden and to the sea-shore respectively, I bring back two bundles—one of land-plants, the other of sea-plants. Everything from the garden gives me blaze-currents; nothing from the sea-shore does so. I am entitled to say that land-plants blaze, and that sea-plants do not blaze. I do not at this stage commit myself to any quantifying prefix to the subjects of these two propositions; more extensive trials will be required before we shall venture to say whether only "some," or "most," or "all" land- and sea-plants do or do not blaze.

§ 11. So we set ourselves the task of finding, on the one hand, a land-plant that does not blaze, and, on the other, a sea-plant that does blaze. We hardly expect to find a hard-and-fast "yes" or "no" in every case we try, but rather a difference of degree, perhaps; so we shall take note of the voltage of the blaze-currents, by comparing their galvanometric effects with the effect through the same circuit of a known standard voltage. Of course this will not mean that we have arrived at any true electromotive value of the blaze-current, but it will be better than nothing.

§ 12. I think of water-plants, and ferns, and fungi as possibly non-blazing land-plants. So I fetch some watercress, and leaves of hart's-tongue fern, and a fungus from a tree-stump in the garden.

§ 13. I begin with the fungus:—

	0·001 volt	gives a deflection...........	= 25 mm.
Exc. by	Br + 10000	gives homodrome blaze	= + 250 ,,
,,	Br − 10000	,, nothing at all.	
,,	Br + 10000	,, a smaller blaze	= + 60 ,,
,,	Br − 10000	,, nothing at all.	

The fungus evidently gives a blaze-current; but beyond this bare fact there are already several points of detail that must arouse reflection and provoke further study.

The blaze-current is only in one direction, from B to A, "positive," and aroused only by current in that same positive direction. On looking to see how the fungus is orientated between the electrodes, I find that the dorsal surface is on B and the ventral surface is against A; so that the blaze just witnessed has been from dorsal to ventral surface. It has been aroused by a break induction-shock in the same direction, having therefore the anode at the dorsal surface; it has not been aroused by a shock in the opposite direction, with the kathode at the dorsal surface.

From these points I provisionally infer that the dorsal surface of my fungus is more excitable (*leistungsfähig*) than the ventral surface, and that the exciting current has been more effective at the anode than at the kathode. But we had better not go off into a discussion of this point now.

§ 14. I take a leaf of hart's-tongue, lay it on its face, and lead off from its dorsal surface by the electrodes A and B applied to the midrib 4 or 5 centimetres apart. The trial comes out as follows:—

	mm.
1/100 volt	20
Exc. by break 10000+	100+
,, ,, −	80−
Strong tetanisation.	
Exc. by break 10000+	trace+
,, ,, −	nil
1/100 volt	30

Three points are seen in this experiment: (1) that this leaf manifests strong homodrome blaze-currents; (2) that these currents are abolished by strong tetanisation; and (3) that the resistance has been considerably reduced.

§ 15. And now, again, questions press upon us. Is the effect of tetanisation temporary or permanent? Will a leaf give a succession of blaze-currents of diminishing or undiminishing magnitude? What relation is there between strength of excitation and strength of blaze? What are the time-relations? What is the cause of the diminished resistance?

All these questions clamour for their answers; but they must wait.

§ 16. The next object I undertook to test was some duckweed. The results of its trial are as follows:—

1/100 volt through electrodes.	
,, ,, ,, and a leaflet.	
Blaze after break-shock 10000+	is +
,, ,, ,, −	is −
After strong tetanisation:—	
Blaze after break-shock 10000+	nil
,, ,, ,, −	nil

It is not a convenient plant to work with, because the leaf is so small. I try whether a mass of overlapping leaves give blaze, and find that they do not.

§ 17. Clearly land-plants are more interesting than sea-plants. But the contrast between the two kinds, whatever its meaning may be, is a fact of primary importance. I want to confirm it, or the reverse, by every means in my power. So I offer at the next meeting of my family to give two prizes—one for any blazing sea-plant, the other for any non-blazing land-plant. I make the proviso as to the latter that it must be a plant capable of conducting an electrical current, not a non-conducting dry leaf or bit of wood. I also stipulate, as conditions of the prizes, that the winning land-plant shall give less than 0·001 volt, the winning sea-plant more than 0·010 volt.

Many things are brought to the galvanometer in a short space of time, from the garden and from the sea-shore. Nothing from the garden fails to blaze; nothing from the sea-shore gives anything like a blaze. True, a holly-leaf from the garden gave no clear blaze; but its electrical resistance was so great that current sufficiently strong to excite could not traverse it. And, on the other hand, a leaf from among the seaweed which did give a blaze was pronounced to be an intruder from a neighbouring stream.

The competitors abandoned their quest as hopeless, being even more convinced than I am that land-plants blaze, while sea-plants do not blaze. I am indeed satisfied that sea-plants do not blaze anything like land-plants; but I am not sure—indeed, I think it quite unlikely—that no sea-plants give any blaze at all *.

§ 18. *An Ivy Petiole versus a Geranium Petiole.*—All land-plants are not equally vigorous as regards their electromotive effects; some are more vigorous than others. I found, a year or two ago, that seeds lose power in this respect by mere lapse of time.

An ivy-leaf petiole as compared with a geranium-leaf petiole, under physical conditions as nearly as possible identical, affords a convenient illustration of the general principle that amount of blaze bears some general relation to degree of vitality or vivacity.

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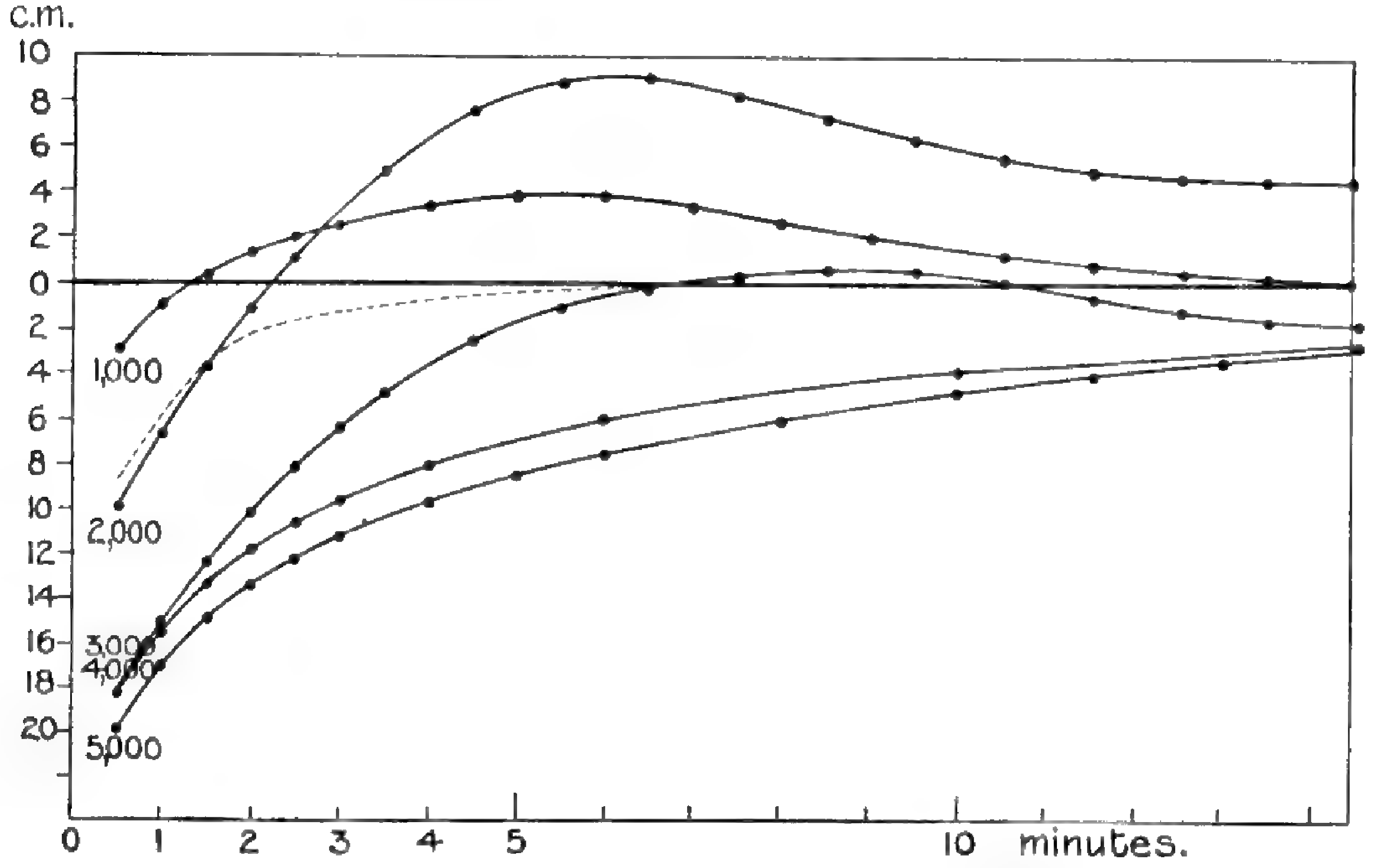
* Ultimately a long narrow seaweed, called "boot-laces" by the fishermen, *Chorda Filum* by its museum name, was brought in, and gave typical homodrome effects in both directions, amounting to as much as 0·02 volt. The peculiarity is possibly due to the transverse septa subdividing the length of weed. Another jointed seaweed coralline was subsequently found, giving about 0·01 volt.

The ivy petiole is comparatively sluggish; the geranium petiole is comparatively lively. Under similar conditions, the response or blaze of the former is below $\frac{1}{100}$ volt, while that of the latter is upwards of $\frac{5}{100}$ volt.

§ 19. THIRD DAY.—Some of the questions asked in § 15 require to be answered, and I shall make use of peas for the purpose. Peas in their pod afford us an unlimited supply of individual test-objects, similar, and protected from accidental injury.

The relation between strength of excitation and strength of blaze-current, and the time-relations of the latter, are easily examined. The observations have to be made in a systematic and leisurely fashion; so I have reserved them for a wet day, offering no external temptations.

Fig. 3.—PEA (*Pisum sativum*). Excitation by a single break induction-shock from A to B. Blaze-current from A to B, *i. e.* homodrome.



The ordinates are in scale-divisions of 1 cm.; with the resistance in circuit, each 1 cm. indicated an approximate voltage=1/1000 volt.

§ 20. The observation of each individual blaze-current requires 5, 10, or 15 minutes, according to its strength. A blaze aroused too soon after a previous blaze is smaller than normal. One should allow the zero to be recovered of itself, and not impatiently return to a false zero by manipulating the compensator.

This rule has been observed throughout the series of to-day's readings.

In the first series I have taken readings every half-minute and every minute after excitation of five different strengths, omitting in each case the very first deflection, and beginning at the first half-minute after excitation.

The series of observations has lasted 1½ hour, without appreciable "fatigue" or alteration of resistance.

The dotted curve gives a second blaze by 1000 at end of series.

Fig. 4.—Relation between strength of Stimulation and magnitude of Blaze.

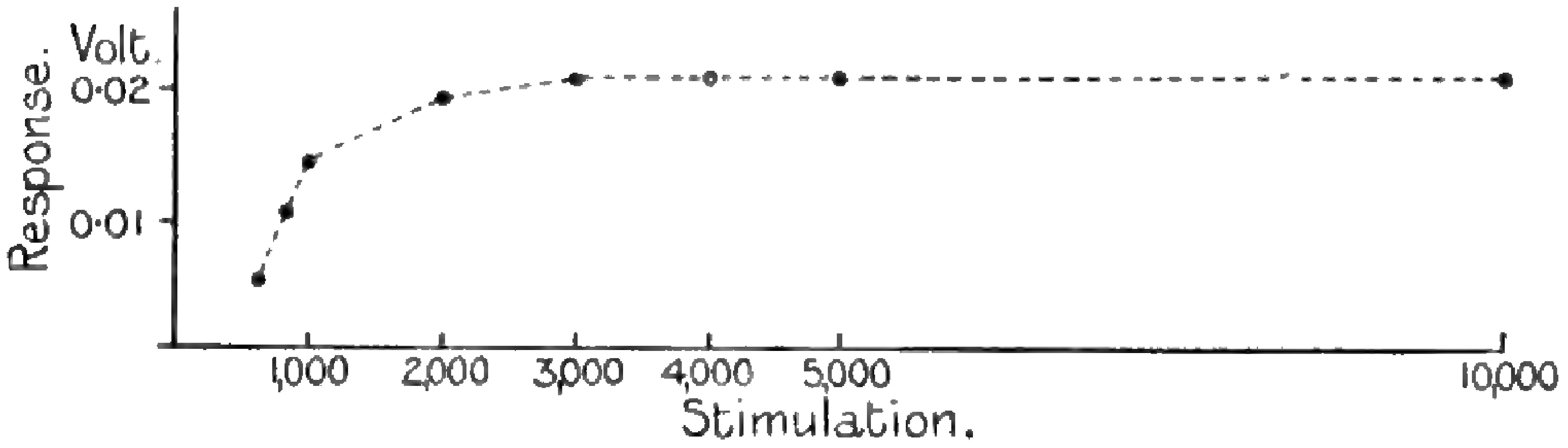
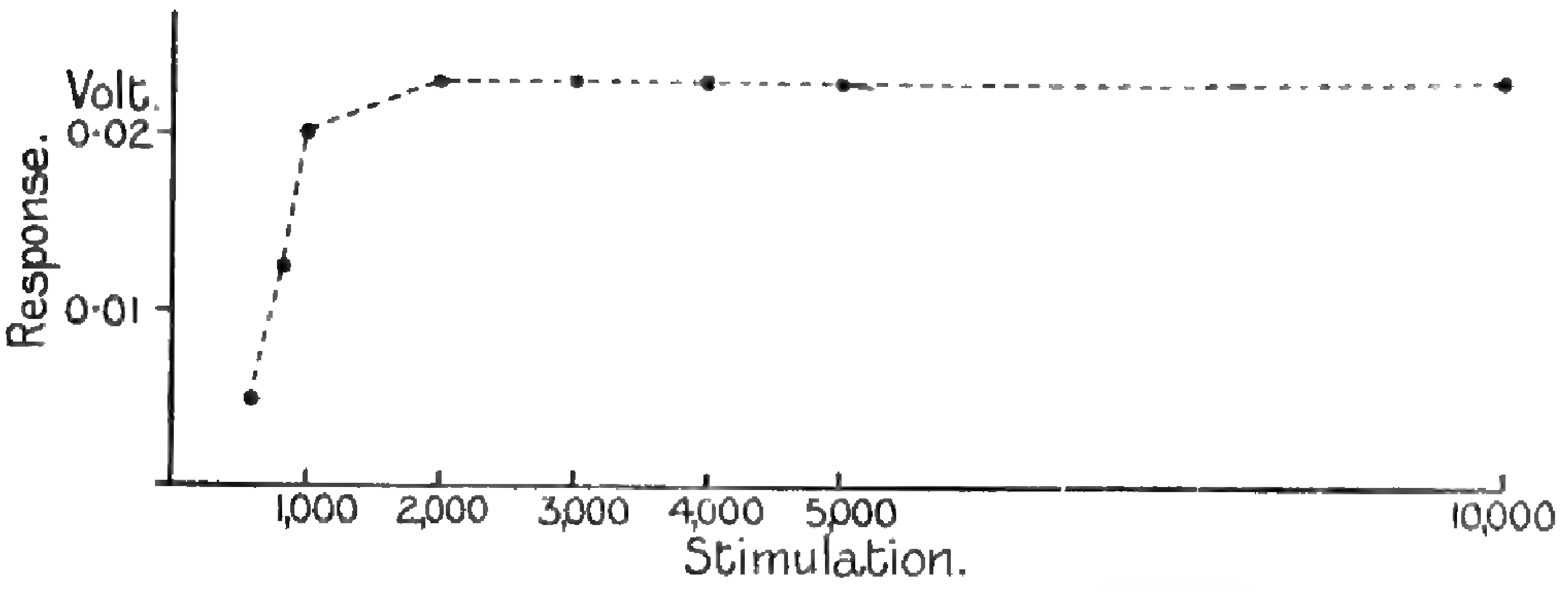


Fig. 5.—Ditto, ditto.



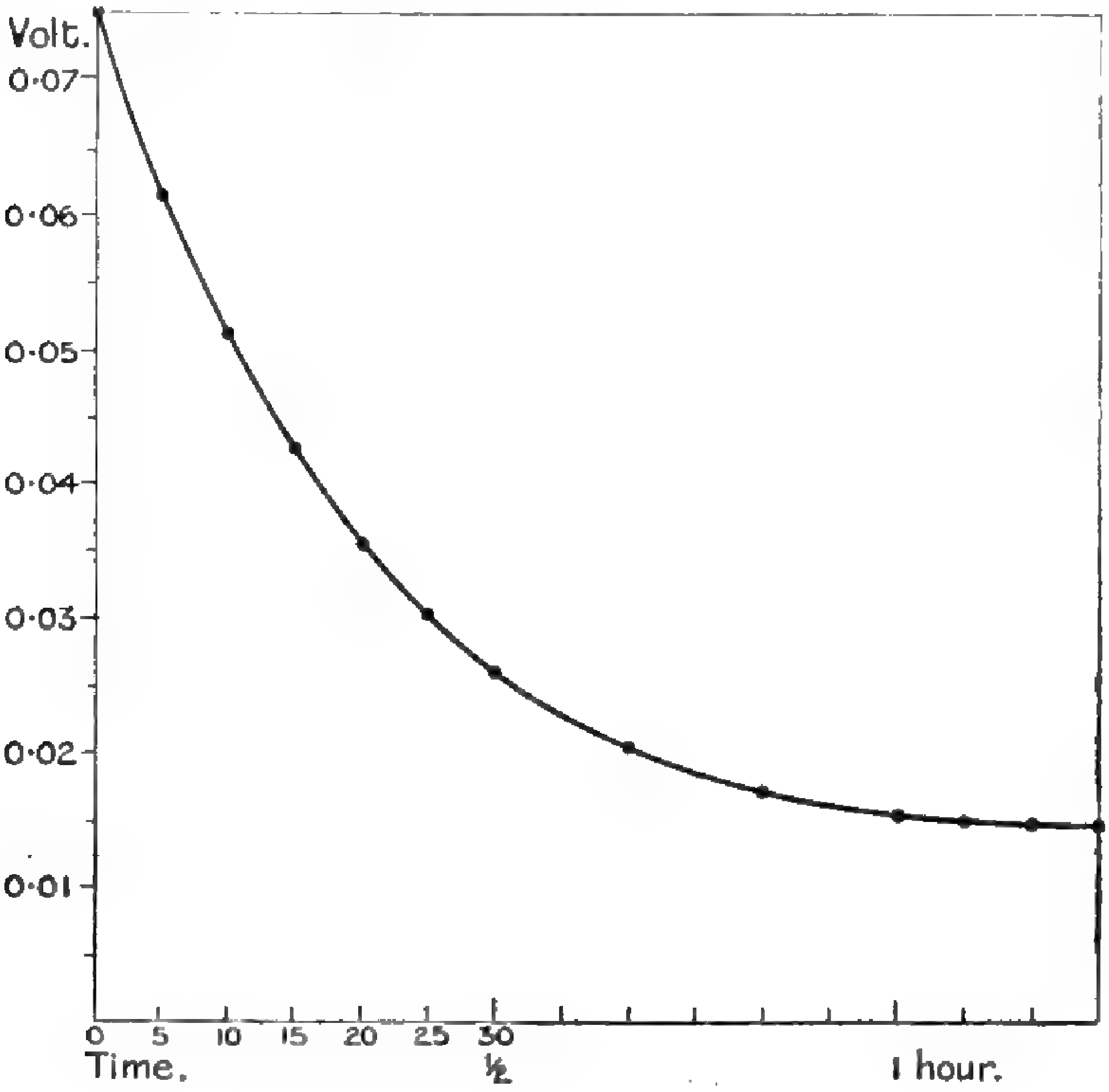
In the above two series (figs. 4 & 5) the readings taken are those of the galvanometer-swing produced when the blaze is let through by means of the key R, immediately after passage of the exciting current. The effects are homodrome, *i. e.* in the same direction as the exciting current; and the range from minimal to maximal is not a very extensive one—from, *e. g.*, 600 to 2000 units of a Berne inductorium fed by two Leclanché cells.

§ 21. In dealing with animal tissues it is very difficult, if not impossible, to get two isoelectric contacts when the electrodes are first applied; there is always more or less accidental current, by reason of unavoidable injury or from other causes.

Precisely the same difficulty presents itself in the case of vegetable tissues. It is advisable to leave them undisturbed in contact with the electrodes for some time before an experiment is begun; at the end of an hour they may generally be considered to have settled down to a stable state.

§ 22. The "current of injury," whether accidental or provoked, is very considerable; it gradually subsides, as in the case of animal tissues, and can then be renewed by renewed injury. The following curve gives the decline of E.M.F. of a pea, led off by a freshly-cut and an intact surface.

Fig. 6.—PEA (*Pisum sativum*). Decline of Current of Injury after a preliminary rise.

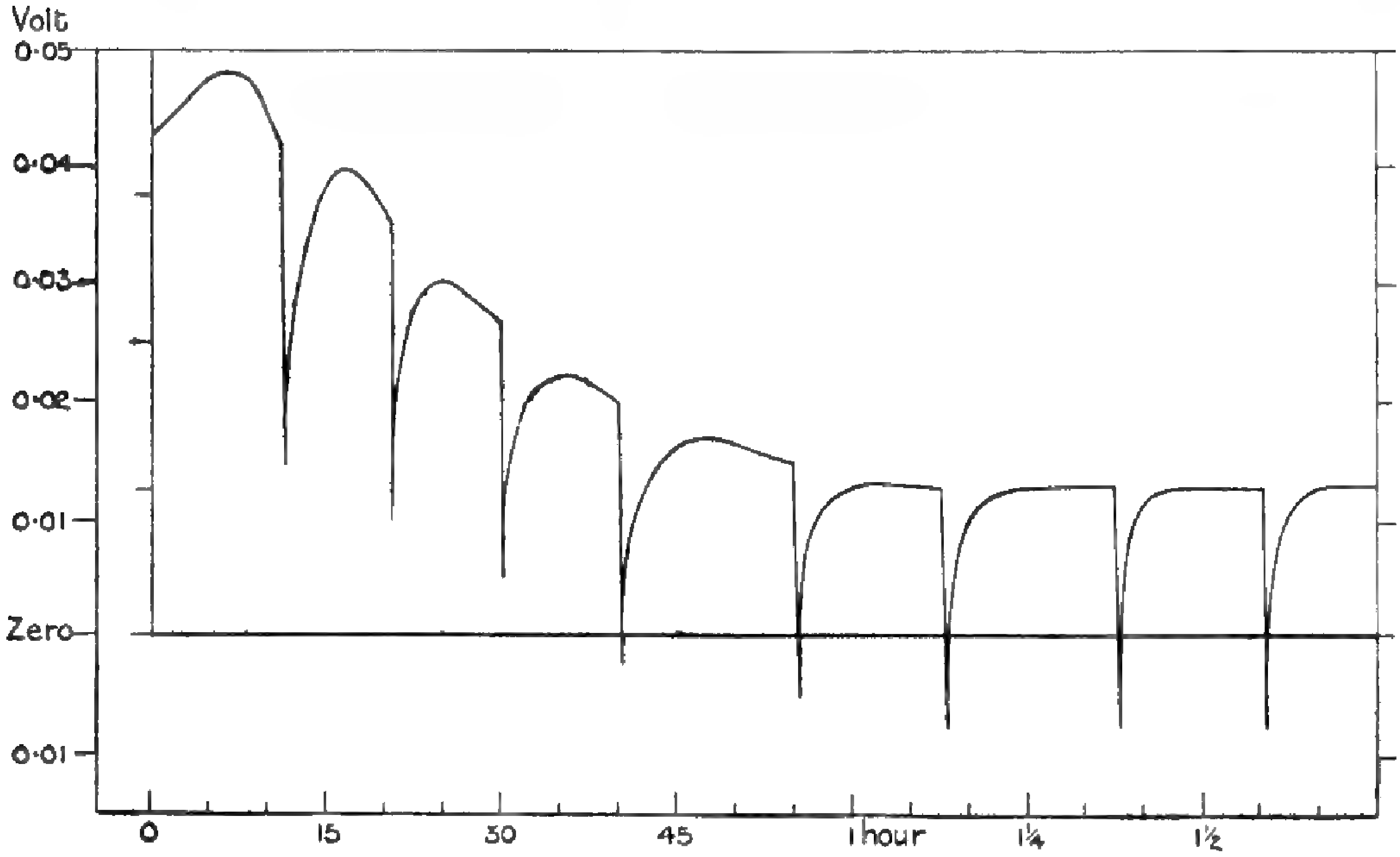


§ 23. At first—*i.e.* for the first 5 minutes—the current of injury increases. This preliminary increase, amounting to 0·005 to 0·010 volt, calls to mind the similar increase recently pointed out by MacDonald and Sowton in the case of the current of injury of mammalian nerve. Clearly, however, the explanation invoked by these authors for their case—viz., augmentation of concentration-current by cooling—will not apply to the present case. I have no very dogmatic explanation to offer; it looks to me very like an imbibition current at a cut surface.

§ 24. A blaze-current provoked in a vegetable organ during its manifestation of a current of injury is, in general, opposite to it in direction, whatever may have been the direction of the exciting current. Du Bois Reymond would probably have called it a negative variation of a previous current.

Blaze-currents caused by excitations of moderate strength at sufficiently long intervals in the course of a declining injury-current are of diminishing magnitude. The smaller the injury-current, the smaller is its negative variation.

Fig. 7.—Pea (*Pisum sativum*). Negative variations of Current of Injury.



§ 25. Fourth Day.—We intend to find out to-day what sort of magnitudes the currents of different peas present: whether they differ at different stages of maturity, whether individual peas of the same pod vary more or less than peas of different pods, and so forth.

§ 26. I begin with a comparison between two very different pods: one quite ripe and fully distended, of which the cooked peas would be rather hard and *passés* ; the other immature, with tender young peas at, I should say, a quarter to half their normal bulk.

The contrast, galvanometrically, is very striking indeed. The adult peas give large current of injury and large blaze-current. The infant peas give small and irregular current of injury and no blaze-current to speak of.

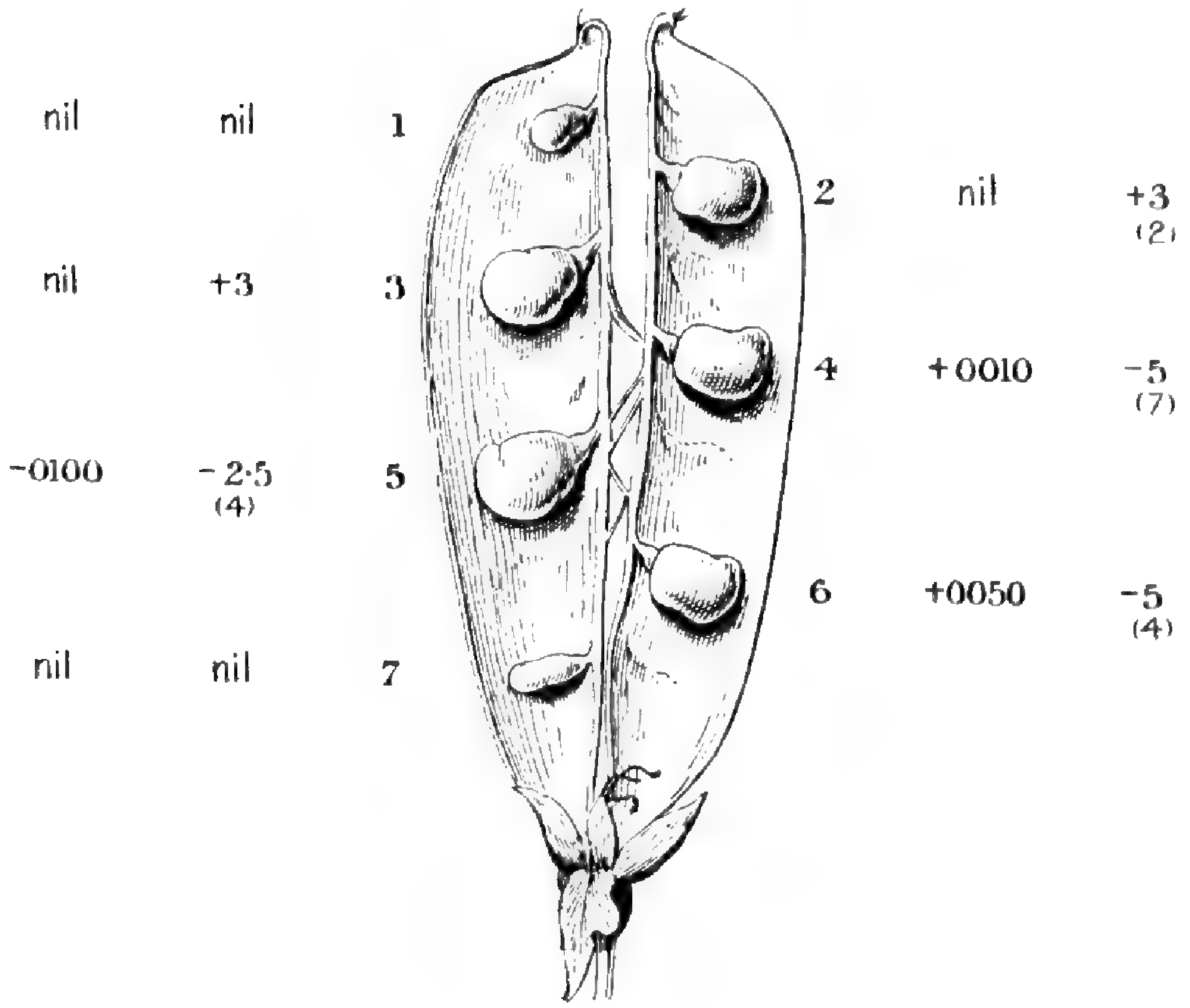
7 Peas.
A mature pea-pod, taken from before backwards.

No.	Current of injury. volt.	Blaze by 1000 —←— (1/100 volt = 13 cm.). cm.
1 ...	+0·0210	− 5
2 ...	+0·0430	−11
3 ...	+0·0450	> −20
4 ...	+0·0500	−14
5 ...	+0·0520	> −20
6 ...	+0·0570	> −28
7 ...	+0·0430	−13

6 Peas.
An immature pea-pod.

Current of injury. volt.	Blaze by 1000 —←— (1/100 volt = 13 cm.). cm.
−0·0150	nil
−0·0060	nil
+0·0100	−2
+0·0040	−1
−0·0080	nil
+0·0100	nil

Fig. 8.



§ 27. I think the result is of considerable importance. If there has been no mistake—and it will be an easy matter to make sure of this by further trial—we have in our hands a very clear and convenient field within which to test a relation between physiological states and electrical responses.

§ 28. As a rule, the middle peas of a pod give the largest blaze-currents; the peas at both ends, being as a rule less developed than the others, give smaller effects, if any. We may pick out pods more or less completely ripe, and find only the middle peas giving currents.

And it is interesting in this connection to note that the rule applies to injury-currents as well as to blaze-currents.

§ 29. Fifth Day.—Young peas have a truly enormous electrical resistance; a tenth of a volt through pea and galvanometer in series gives a hardly appreciable deflection. This is not merely a skin-resistance, for it persists after a slice has been taken off each end of the pea; it is a resistance attributable to deficiency of electrolytes.

An adult pea is a much better conductor; an adolescent pea is of intermediate conducting value.

The resistance is greatly reduced in consequence of a single electrical shock; and I find reason for believing that the alteration is partly due to the multiplication of electrolytes by dissociation.

Alterations of conductivity of old and of young seeds in consequence of the passage of induction-currents.

Full-grown Peas.			Young Peas.			
Initial conductivity.	After one break-shock.	After tetanisation.	Initial conductivity.	After one break-shock.	After tetanisation.	
50	70	90	2·25	22·5	55	
40	70	70	0·5	25	50	
60	70	75	2·5	22·5	65	
	70	75	0·5	30	55	
					45	½ hr. later.
					45	1 hr. later.
					65	after tetanis.
					50	½ hr. later.
					60	after tetanis.
					55	½ hr. later.
					65	after tetanis.
				Next day	85	
					100	after tetanis.
					95	1 hr. later.

§ 30. A sufficiently obvious fallacy may arise from this source. Suppose we have a quite young pea on the electrodes, with a fresh-cut surface at B, so that the current of injury is positive: the resistance is very high, the deflection is small, and we have to use a considerable voltage from the compensator in a negative direction in order to bring the spot back upon zero. A strong induction-shock is now sent through the pea in the negative direction, the after-effect of which is a large deflection in that same direction. We find that the resistance is greatly diminished, and the large deflection to the left may evidently be due to our large compensating voltage. While the resistance was high, we might easily have over-compensated; so that the over-compensation would come into evidence when the resistance was reduced. Of course, to do this, the alterations of resistance would need to be very great. And they are so,—it is not uncommon to see the resistance reduced to $\frac{1}{10}$ of its original value by a single strong induction-shock.

§ 31. I have seen the fallacy in another form. A young pea, with its base cut, has a current of injury in the positive direction which, by reason of the enormous resistance, gives a barely appreciable deflection. A single induction-shock is sent through the pea in the positive or in the negative direction; an apparent blaze-current is manifested in the positive direction, which, however, I do not consider to be a true blaze-current, but only a deflection due to the positive current of injury through a suddenly diminished resistance.

§ 32. The different behaviour of young peas and old arouse many reflections. The old are conductors; the young are non-conductors. Conduction is by electrolytes. Salts—or their ions—are electrolytes *par excellence*. Are there more salts in old peas than in young? And what is the meaning of Loeb's recent investigations into the influence of salts upon the development of ova? I have no means of reply; so the questions must wait.

§ 33. *The Holly-leaf experiment.*—Here is a curious experiment on resistance, with a holly-leaf. I say curious, because it has aroused my curiosity, and I cannot rest satisfied with the explanation that offers itself.

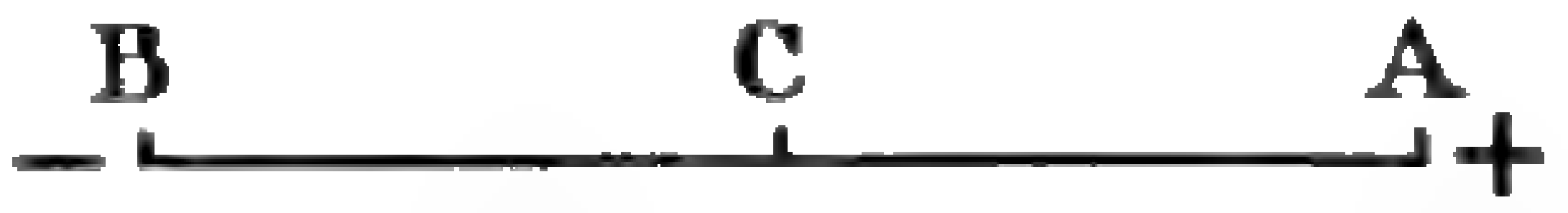
The leaf is placed between the electrodes as usual, in series with the galvanometer and secondary coil. I send an induction-shock through the circuit—first a make, then a break; the make deflection is comparatively small, the break deflection comparatively large. And now, if alternating make and break shocks are passed, the galvanometer-spot flies off in the direction of the break. The familiar physiological effect known as von Fleischl's deflection is exactly simulated.

But it is not a physiological effect in this case; for it comes off on a boiled holly-leaf and on a thick piece of glazed note-paper. The irresistible conclusion is that we have to do with a case of variable resistance, smaller to the break than to the make shock, as is said to occur in the passage of alternating currents through a vacuum-tube.

Whether this be a valid explanation or not, the fact itself is well worth our notice, lest we should confuse a simple physical phenomenon independent of the living state with a similar physical phenomenon characteristic of that state.

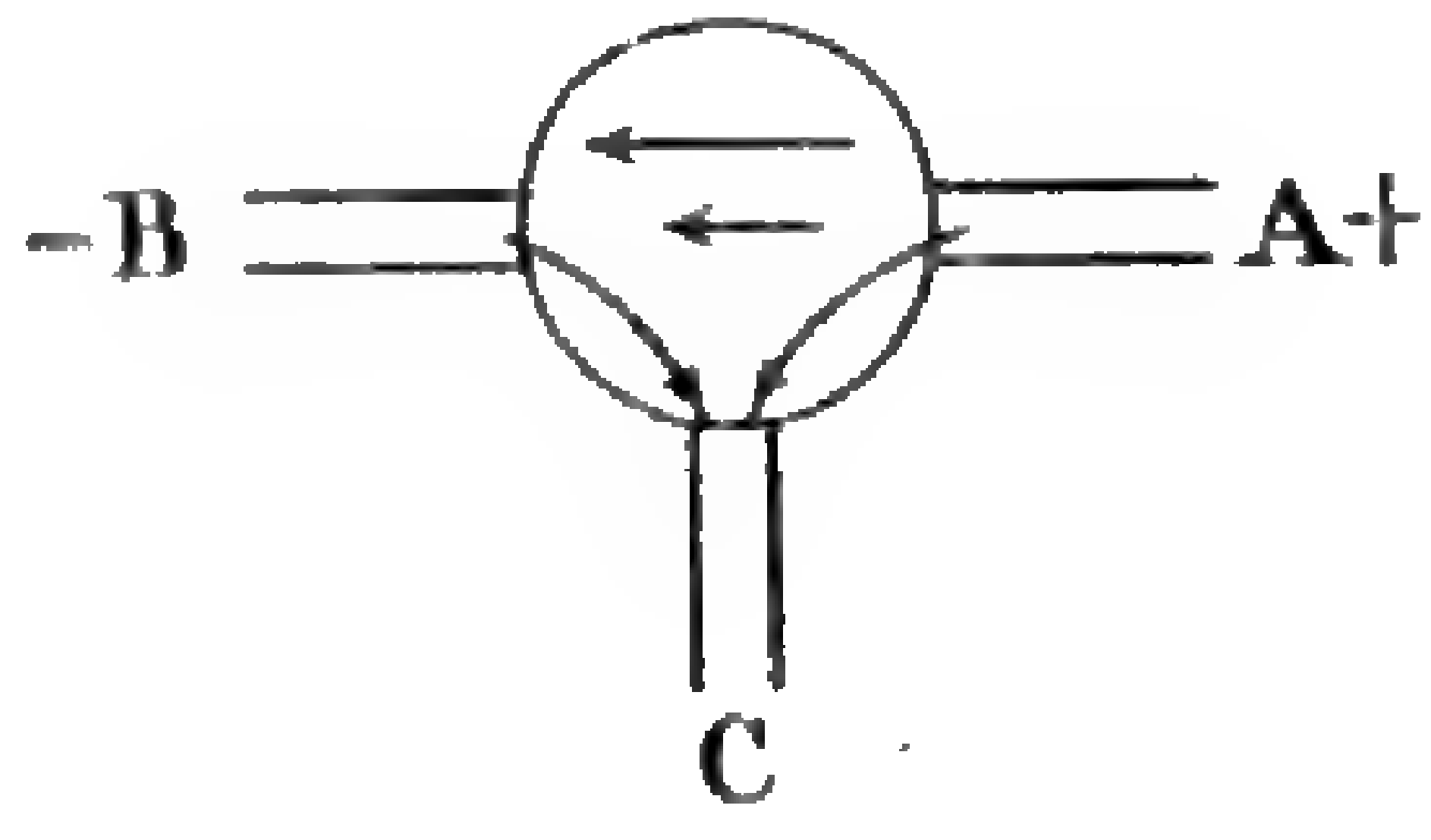
§ 34. Sɪxᴛʜ Dᴀʏ.—We have reached our last day, and have made little or no use of the accessory piece of apparatus (B A C, § 3) set up on the first day. The apparatus has not "earned its living"; and though we may not hope to make it do so in a single day, we may at least do something to justify its inclusion in the travelling-box. We shall use it to-day for two or three localisation trials, preliminary to a more systematic inquiry next year.

§ 35. *Experiment to determine the direction and magnitudes of the separate electromotive changes at the two poles of an exciting current.*



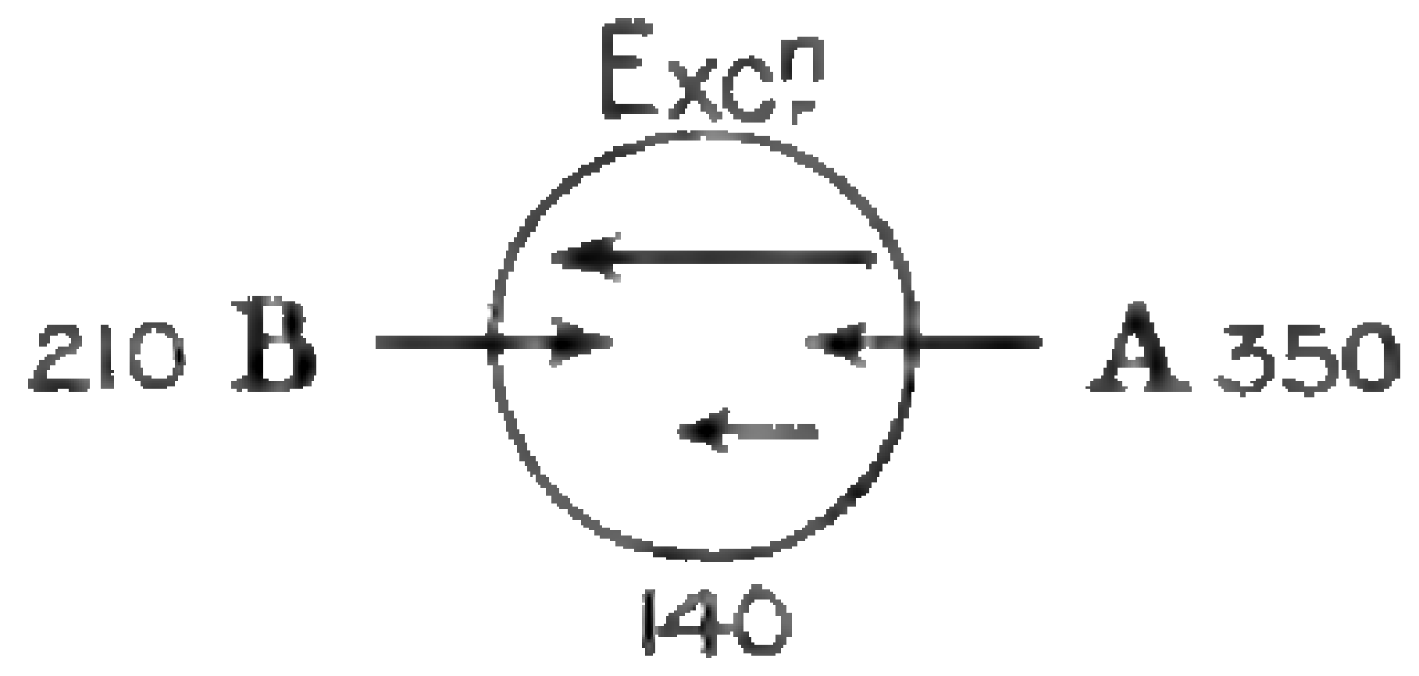
Excitation by a single break induction-shock 10,000—, from A to B, *i. e.* so that A is anode and B is kathode.

Compensation established between A and B, B and C, and A and C, before and after excitation.



The compensation-values are :—

	Before.	*After.*	Difference.	Changes in the Pea.
Between A and B......	−0·0090	+0·0030	+0·0060	−0·0060
„ B and C......	−0·0240	−0·0450	−0·0210	+0·0210
„ A and C......	+0·0140	+0·0490	+0·0350	−0·0350

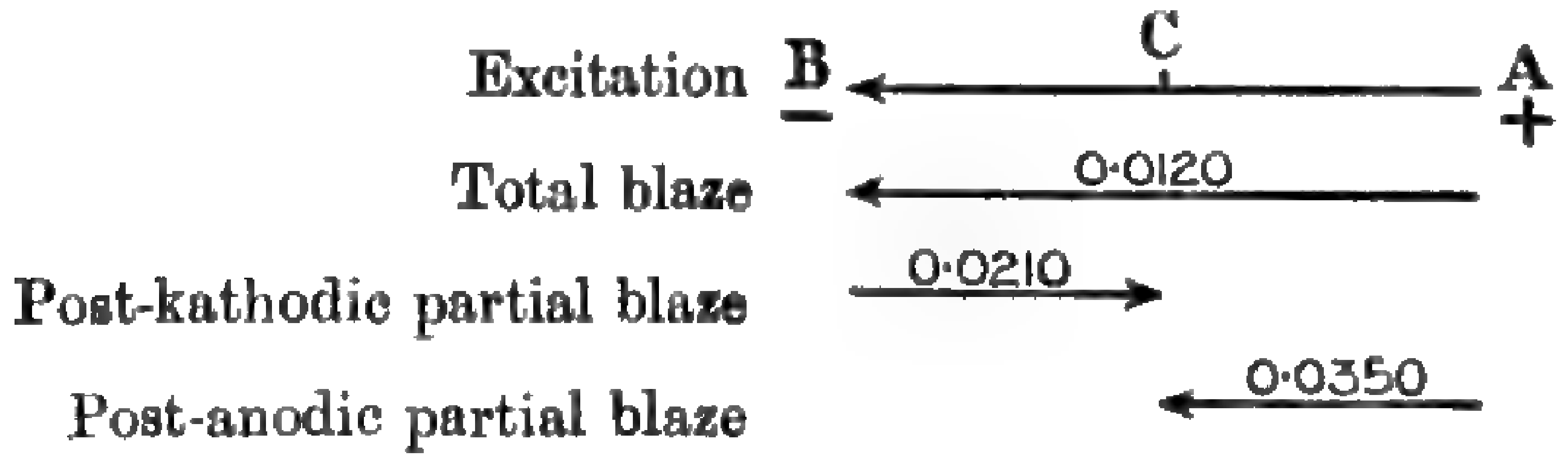

Excⁿ
210 B
A 350
140

The events in the pea itself have been as follows :—

Excitation from A (anode) to B (kathode).

Partial blaze at A	=	−0·0350
Partial blaze at B	=	+0·0210
Their algebraic sum	=	−0·0140
Total observed	=	−0·0120

i. e., both partial blazes have been ingoing ; the total blaze has been homodrome with the exciting current ; the post-anodic homodrome blaze has been greater than the post-kathodic antidrome blaze.


Excitation
B
−
C
A
+
Total blaze
0·0120
Post-kathodic partial blaze
0·0210
Post-anodic partial blaze
0·0350

§ 36. *Experiment to determine the alterations of resistance separately at the two poles of an exciting current.*—Excitation by a single break induction-shock, 10000−, from A to B.

Deflection observed by $\frac{1}{10}$th volt between A and B, B and C, and A and C, before and after excitation. The conductivities are as follows :—

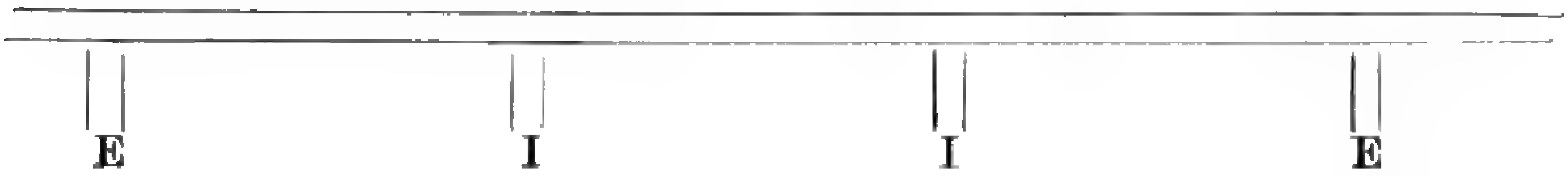
	Before.	*After.*	Conductivity.
Between A and B	2	20	×10
„ B and C	11	13	× 1·2
„ A and C	1·5	10	× 6·7
Between A and B	9	38	× 4·2
„ B and C	8	9	× 1·1
„ A and C	5	10	× 2·0

Mo. Bot. Garden
1906

These two observations were taken on a young pea; the next is on an old pea :—

	Before.	*After.*
Between A and B	95	100
„ B and C	75	80
„ A and C	75	75

The conductivity is increased at the anode and at the kathode, more so at the former than at the latter.



§ 37. *Experiment on a geranium-stalk to see whether the alteration of resistance affects the substance as well as the skin, whether it is interpolar as well as polar.*—Deflection by $\frac{1}{10}$th volt through I I before and after tetanisation through E E:

	Before Exc.	After Exc.
I I	2·5	6·5
E E	1·5	5·0

i. e., the interpolar region I I is affected by the excitation through E E; the alteration is not an exclusively polar effect.

The effect of excitation I I upon the resistance E E is, of course, much less pronounced :

	Before Exc.	After Exc.
I I	1·75	12
E E	2·5	2

INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

The Royal Society has been engaged for some years past in arranging for the publication of an International Catalogue of Scientific Literature, beginning from the 1st January, 1901. Each science will be represented in an annual volume containing lists arranged under authors and subjects, of all books and papers published during the year; these will be contributed through official channels of information—abroad, by direct control of the respective governments—at home, by means of the various Societies which devote themselves to particular sciences; those Societies whose domains overlap having arranged for mutual cooperation.

The collection of title-slips for the United Kingdom of Great Britain and Ireland as regards

BOTANY

has been undertaken by the Council of the Linnean Society, and they appeal to all botanic workers for support in their endeavour to compile a complete record, by sending notices promptly of all botanic issues to the undersigned.

The second volume, for 1902, is now in the press.

B. DAYDON JACKSON,
General Secretary, Linn. Soc.

NOTICE.

◆

Vol. XXXV. has been completed by the issue of Part 248.

Vol. XXXVI., of which Parts 249–254 are already published, is reserved for the completion of the Chinese Flora.

Attention to this announcement is specially requested, to prevent application to the Librarian for unpublished Parts.

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THE JOURNAL
OF
THE LINNEAN SOCIETY.

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Some Notes on the "Sudd"-Formation of the Upper Nile. By A. F. Broun, Director of Woods and Forests in the Soudan. (Communicated by C. H. Wright, A.L.S.)

[Read 3rd November, 1904.]

Much has already been written about the vegetation of the marshes of the Upper White Nile. Sir William Garstin's admirable report on the Bahr el Jebel, published in 1901, not only describes the chief constituents of the "Sudd," but also the circumstances in which vast masses of floating vegetation are moved hither and thither and block the waterways, by forming dams (Arab "sudd") across them. A trip in a sailing-boat undertaken in 1903, which kept me for about four weeks in that country, and another shorter trip recently made, have enabled me to add the following notes, which may be of interest as tending to show the process of Sudd-formation.

The mouth of the Bahr el Jebel near Lake No, and at 627 miles by river above Khartoum, may be taken as the northern gate of the Sudd-region—a vast country of swamps, which stretches westward across the mouths of all the tributaries of the Bahr el Ghazal, which, with a stretch of the White Nile joined at Lake No, roughly form the northern boundary. Eastward the swamps reach in their northern portion as far as the somewhat higher land between the Bahr el Jebel and the arm of the Nile known as the Bahr el Zeraf. To the south of the spot where this arm leaves the Bahr el Jebel, at about 240 miles by river to Lake No, the swamps stretch to the east perhaps as far as the Upper Sobat. Southward the swamps extend to beyond Gondokoro, but they are of lesser width at Bor, a Dinka village about 380 miles by river from Lake No.

In the Sudan, when speaking of the "Sudd," it is generally understood that the portion of the river between Lake No and Shamba is meant. Shamba is a military post situated on the left bank 266 miles from Lake No. It was in this section that, after the overthrow of the Dervish rule, the channel was found to be blocked at several places by masses of floating vegetation, the clearing of which has cost the Egyptian Government considerable sums of money, and the Sudan Government the health and lives of many of its employés. In this portion the river twists and turns through swamps which often stretch as far as the eye can reach from the top of the mast of a sailing-boat or from the upper deck of a steamer. Near many of the bends sheets of water, sometimes several square miles in extent, are to be seen, and glimpses of other subsidiary channels are also obtained. Here and there, especially in the southern portion of the Sudd, lines of trees are visible in the far distance, showing the limit of the swamps. In places, spits of low land dotted with termite-hills, and with some trees and bushes, reach into the swamps close to the main channel. There are also occasional islands with similar vegetation; one of these is at Hillet en Nuer, about halfway through the Sudd, and it served as base camp for the recent Sudd operations. A short way to the south of this, the clearing of one block has still to be completed, and boats have now to make their way through a chain of large lakes. Near Shamba the left bank, covered with an open forest of large trees, comes to within a mile or so of the main channel.

The main channel is usually marked by a constant string of floating vegetation, which may consist of solitary *Pistia Stratiotes*, Linn., of masses of *Cyperus Schimperianus*, Schrad., and other sedges, or of large or small clumps, usually varying according to the state of the weather, of *Papyrus*, *Panicum pyramidale*, Lam., or *Typha australis*, Schum. & Thonn., the most common being twisted strands of rhizomes of *Panicum pyramidale*, enclosing smaller floating weeds such as *Azolla nilotica*, Decne., and *Pistia*.

Starting from Lake No, the channel is, for many miles, lined on both sides by a continuous border of Papyrus, dotted here and there by occasional clumps of Ambatch (*Herminiera Elaphroxylon*, Guill. & Perr.). This lining of tightly packed shoots, some 10 to 15 feet high, is, in places where water is of the right depth, of considerable thickness, but in shallower water large stretches of *Typha* are visible behind the Papyrus hedge. These stretches are dotted here and there with clumps of Papyrus and Ambatch filling the deeper pools. In this portion of the Sudd region *Panicum pyramidale* is not very common.

On inspection of the Papyrus fringe near the channel it will be found that the mass is tightly bound together by numerous twiners and climbers, the most common being *Vitis ibuensis*, Baker, *Vigna nilotica*, Hook. f., and three species of *Ipomœa*, viz. *I. Lindleyi*, Choisy, *I. palmata*, Forsk., and *I. reptans*, Poir. The last named has a hollow-jointed rhizome, which floats on the surface and by means of its shoots binds together those given out by the rhizomes of other plants. Among the Cucurbitaceæ, *Luffa ægyptiaca*, Mill., and *Adenopus breviflorus*, Benth., are also common.

Amidst the tangle of rhizomes of the Papyrus other plants also spring up, and their roots and the soil which they gather fill up the interstices of the mass. The most showy of these are *Hibiscus diversifolius*, Jacq., and *Melanthera Brownei*, Rohr. The little bays and inlets and placid pools are covered with *Pistia*, *Azolla*, *Trapa bispinosa*, Roxb., *Hydrocotyle natans*, Cyr., *Utricularia Oliveri*, Kam., *Jussiæa diffusa*, Forsk., *J. pilosa*, H. B. & K., *Ceratophyllum* sp., *Nymphæa Lotus*, Linn., sedges, and others enumerated in the list at the end of these notes.

Towards Hillet en Nuer the banks of the channel are often better defined, and Papyrus is frequently replaced by the tall reed *Phragmites communis*, Trin., while *Panicum pyramidale*, Lam. (called "Om-Suf," or "Mother-of-wool," by the Arabs on account of the irritant hairs at the base of the leaves), which has the faculty of growing both in shallower and in deeper water than Papyrus, not only occupies the land which is uncovered or nearly so at low Nile, but forms a fringe in front of the Papyrus in the bed of the channel. South of Hillet en Nuer *Phragmites* is still more common, and is festooned by the same twiners mentioned above, the most abundant being *Ipomœa palmata*.

The islands and spits of land, which are only covered at high Nile, are usually grown over with thick grass and sometimes with open woods of small *Acacia Suma*, Kurz, or with scattered trees, frequently growing on the top of termite-hills, chiefly *Cratæva religiosa*, Forst., with some *Borassus flabellifer*, Linn., *Hyphæne thebaica*, Mart., *Euphorbia Candelabrum*, Trém., and occasional *Kigelia æthiopica*, Decne., and *Trichilia emetica*, Vahl. On the somewhat higher ground afforded by the termite-mounds are also found a pretty white-flowered shrub, *Clerodendron* near *neriifolium*, Vahl, also *Capparis tomentosa*, Lam., *Sanseviera guineensis*, Willd., *Withania somnifera*, Dun., and bulbs of the showy *Hæmanthus multiflorus*, Martyn.

The Ambatch is much more abundant in the southern portion of the Sudd, and forms woods of some extent, usually lining channels of lakes.

Above Shamba the course of the river is, for some distance, even more tortuous. At first the bends keep nearer to the left bank, but above Kenissa, the site of the old Austrian Mission of Ste. Croix mentioned by Sir S. Baker, the course gradually approaches the right bank, which only becomes visible far in the distance some way above Shamba. At Bor it actually flows under the high right bank. Above this point the main channel goes from one bank to the other and back again, and, although the marshes between the high banks on either side are still of considerable width (at least as far as Mongalla, our southernmost post, 474 miles above Lake No), the boundaries of the Nile Valley above Bor are well defined.

As regards the vegetation of this part, it is striking that some way above Shamba the banks begin to be better defined and that Papyrus gives way gradually to Om-Suf, the former being, in the southern swamps, only represented by clumps or belts denoting depressions in the surface of the ground. The grass-covered surface is dotted here and there with trees, either solitary or in clumps, chiefly *Cratæva religiosa*, Forst., *Kigelia æthiopica*, Decne., and *Ficus Sycomorus*, Linn., the low banks being often covered with fairly dense fringes of *Sesbania ægyptiaca*, Pers.

It appears to me most likely that, at some time more or less distant, the Nile debouched near Bor into a large lake, the northern limit of which was marked by the rise of the ground towards the Nuba hills in Kordofan, still marked by the Bahr el Ghazal and the White Nile flowing from west to east as far as the Sobat mouth. It is possible, and even probable, that this lake did not, at first, occupy so wide an area as is now covered by the swamps, but that it gradually became filled with silt, the cone of dejection spreading northwards from Bor. This would account for the present disappearance of Papyrus in the southern portion of the swamps.

It is also easy to conceive how, as the water in the lake became shallower, its surface was covered with vegetation. Among the plants growing on the shores of the lake were some furnished with more or less tubular rhizomes which they sent out over the surface of the water, and, being numerous, crossed and recrossed each other and interlaced, thus forming rafts, sometimes of considerable thickness and buoyancy. The most important of these plants are now the chief Sudd plants: they are *Cyperus Papyrus*, *Panicum pyramidale*, *Phragmites communis*, and *Typha australis*. Of these the *Panicum* and the *Phragmites* have not only the lightest and most tubular, but also the longest rhizomes. I have seen the whole channel of the Bahr el Arab choked with rhizomes of the *Panicum*, while the rhizomes of the *Phragmites*, floating in the Nile channel, are often 15 to 20 yards long.

The rafts formed by these plants were further strengthened by twiners, which bound them and the shoots they gave out together. Among these *Ipomœa reptans*, which, as I have mentioned before, has also tubular rhizomes and is thus able to reach the most distant shoots, is the most important; but the other twiners, as well as other plants, were soon able to germinate in the soil deposited on the surface of the raft. Their roots and the soil which they gathered, as well as floating waterweeds and vegetable rubbish brought by the wind or currents, filled the interstices of the raft and further consolidated it. These masses of vegetation dropped their roots into the soft ooze at the bottom of the lake; but a rise in the lake or a storm broke away portions of the rafts, which drifted away until they anchored themselves in other shallow places, where they again spread. These movements in the masses of vegetation still take place, and have been fully described by Sir William Garstin.

Although Ambatch is, at certain places in the swamps, *e. g.* the southern part of the Sudd and in the Bahr el Ghazal swamps, very abundant, Sir William Garstin is of opinion that it has no claim to rank in importance, as a Sudd-forming plant, with the species mentioned above. I quite agree with him and believe that it only appears, with other plants, after the rafts of floating vegetation have formed themselves, and that, at the best, it only acts as anchors which help in fixing the rafts in one place and thus form firm land.

That the soil is slowly forming and filling the bed of these swamps, there is little doubt. The Nile in flood at Gondokoro is well nigh as turbid as the Blue Nile when the latter is in flood; but a large proportion of this silt gets deposited on the roots of the plants in the swamps, and in still waters the mud sinks to the bottom. Successive layers of decomposing vegetation should add materially in forming soil, and seeds of large riverside trees, washed from above, may germinate and help in the work of consolidation; but, unfortunately, fierce fires sweep over the whole country and the ashes of the plants are carried away by the wind and a large portion deposited in the channels and carried away, while what seedlings of trees do germinate are, with few exceptions, killed outright by the fires.

The work done by Nature, described above, if sure, is too slow for our progressive times; the immense volume of water which spreads itself and is wasted in these vast swamps is wanted lower down, to change desert and howling wilderness into smiling fields. Much has been done by the great Irrigation Department of Egypt, and among gigantic tasks which still await it is that of draining the swamps of the Upper Nile.

Khartoum, 26th April, 1904.

LIST OF PLANTS SEEN IN THE SWAMPS OF THE UPPER NILE.

(a) *Chief "Sudd"-formers.*

Cyperus Papyrus, *Linn.*
Panicum pyramidale, *Lam.* ("Om-Suf.")
Phragmites communis, *Trin.*
Typha australis, *Schum. & Thonn.*

(b) *Twiners and Climbers* (all common).

Vitis ibuensis, *Baker.*
Vigna nilotica, *Hook. f.*
Luffa ægyptiaca, *Mill.*
Adenopus breviflorus, *Benth.*
? Melothria cordifolia, *Hook. f.*
Ipomœa reptans, *Poir.*
I. palmata, *Forsk.*
I. Lindleyi, *Choisy.*

(c) *Accessory "Sudd"-formers* (including water-plants and plants which grow on the floating vegetation).

Nymphæa Lotus, *Linn.*
Hibiscus diversifolius, *Jacq.*
Herminiera Elaphroxylon, *Guill. & Perr.*
Jussiæa diffusa, *Forsk.*
J. pilosa, *H. B. & K.*
Trapa bispinosa, *Roxb.*
Hydrocotyle natans, *Cyr.*
Melanthera Brownei, *Rohr.*
Sonchus Bipontini, *Aschers.*
Utricularia Oliveri, *Kam.*
Polygonum lanigerum, *R. Br.*
P. tomentosum, *R. Br.*
Ceratophyllum sp.
Vallisneria spiralis, *Linn.*
Boottia scabra, *Benth.*

Ottelia ulvæfolia, *Walp.*
Commelina nudiflora, *Linn.*, cum var.
Pistia Stratiotes, *Linn.*
Lemna sp.
Potamogeton *aff.* pectinato, *Linn.*
Cyperus Schimperianus, *Schrad.*
C. dichrostachys, *Hochst.*
C. latifolius, *Poir.*
C. nudicaulis, *Poir.*
C. articulatus, *Linn.*
Marsilea diffusa, *Lepr.*
Azolla nilotica, *Decne.*

(d) *Plants growing on low, periodically inundated land.*

[NOTE.—The trees the names of which are printed in small capitals are often found growing in the midst of the Sudd, and, although now probably fixed, may originally have started growing on the masses of floating vegetation.]

Capparis micrantha, *Rich.* Shrub (scrambling).
C. Rothii, *Oliver.* Shrub.
CRATÆVA RELIGIOSA, *Forst.* Tree.
Malachra radiata, *Linn.* Herb. (Mouth of Bahr el Zeraf.)
Harrisonia abyssinica, *Oliver.* Shrub.
Trichilia emetica, *Vahl.* Tree.
Æschynomene aspera, *Linn.* Shrub.
Indigofera orthocarpa, *Baker.* Undershrub.
Sesbania ægyptiaca, *Pers.* Shrub.
S. aculeata, *Pers.* Herb. (Bahr el Ghazal.)
Psophocarpus longepedunculatus, *Hassk.* Herb; climber.
Canavalia ensiformis, *DC.* Herb; climber.
ACACIA SEYAL, *Del.* Tree.
A. SUMA, *Kurz* (syn. A. campylacantha, *Hochst.*). Tree.
A. verugera, *Schweinf.* Tree.
Combretum sp. (*near* aculeatum, *Vent.*). Scrambling shrub.
Mollugo Spergula, *Linn.* Herb.
Mitragyne africana, *Walp.* Tree. (On termite-hills, Bahr el Ghazal.)
Oldenlandia sp. (*near* decumbens, *Hiern*). Herb.
Enhydra fluctuans, *Lour.* Creeping herb.
Ethulia conyzoides, *Linn.* Herb. (Mouth of Bahr el Zeraf.)
Marsdenia rubicunda, *N. E. Br.* Woody climber.
Cordia abyssinica, *R. Br.*, var. Shrub.
C. subopposita, *DC.* Shrub or small tree.
Withania somnifera, *Dun.* Herb.
Kigelia æthiopica, *Decne.* Tree.
Asystasia coromandeliana, *Nees.* Herb.

Nelsonia campestris, *R. Br.* Herb.
Clerodendron sp. (*near* neriifolium, *Vahl*). Shrub. (On termite-hills.)
Ocimum gracile, *Benth.* Herb.
Euphorbia Candelabrum, *Trém.* Tree.
? Fluggea microcarpa, *Blume.* Shrub. (On termite-hills.)
Ficus Sycomorus, *Linn.* Tree.
F. capræfolia, *Del.* Shrub.
Celtis integrifolia, *Lam.* Tree.
Sanseviera guineensis, *Willd.* Herb. (On termite-hills.)
Hæmanthus multiflorus, *Martyn.* Herb. (At foot of termite-hills.)
Hyphæne thebaica, *Mart.* Tree.
BORASSUS FLABELLIFER, *Linn.*, var. ÆTHIOPICA, *Warb.* Tree.
Juncellus alopecuroides, *C. B. Clarke.* Herb.
Panicum (*cf.* § Brachiaria).

Descriptions of some New Species, and Notes on other Chinese Plants. By W. J. TUTCHER, F.L.S.

[Read 2nd February, 1905.]

THE species mentioned in the following paper were found on the island of Hongkong, with two exceptions—one from Kowloon, and the other from Wei-hai-wei.

NOTES ON THE FLORA.

The island of Hongkong lies just within the tropics, about 22° North latitude and 114° East longitude. It consists of irregular granite mountain-ridges, the principal of which lies east and west, and is broken up into several peaks—Mt. Victoria in the west being the highest, 1800 feet, whilst Mt. Parker in the east is not much less. The area of the island is about 29 square miles. There are two well-marked seasons—the rainy from May to October, and the dry from October to May. The average rainfall is about 85 inches a year, and most of this falls during the south-west monsoon; the dry season corresponds to the north-east monsoon. The hills are intersected with numerous ravines, and it is in these ravines that the vegetation is richest, more especially in the ravines on the north side of the island. There are one or two exceptions to this, as the woods of the Happy Valley on the north-east and those of Little Hongkong on the south side prove. Approaching Hongkong from the south, one is struck with the apparent bareness of the place, and it is not until one gets near that this idea is dispelled. Most of the vegetation, however, which strikes the eye is due to the work of the Afforestation Department, as millions of ***Pinus Massoniana*** have been planted during the last 30 years. In the 'Flora Hongkongensis,' published in 1861, Bentham enumerated 1053 species as having been found on the island, 159 of which had not, at that time, been obtained elsewhere. Bentham, however, remarked that probably many of these 159 would be found on the mainland of China when the Flora of that country was investigated. This has proved to be the case, for I suppose that at the present time not more than 50 of these 159 remain peculiar to Hongkong. Since the 'Flora Hongkongensis' was published many additions have been made to the Flora of the island by various collectors, so that at the present time it amounts to about 1400 species. Of these 350 or 400 additional species, about 50 have not been observed out of the island, making a total of about 100 endemic species. No doubt many of these will be found on the adjacent mainland as we get to know more and more of its flora. It is interesting to note that some of the species found in Hongkong have not been procured nearer than Hupeh, a distance of about 600 miles north. I might mention examples in ***Machilus macrophylla*** and ***Limacia sagittata***. In all probability these species will be found in all the intervening country and perhaps still farther north and south. ***Rhodoleia Championi***, first discovered by Champion in Hongkong, had not been obtained elsewhere until Dr. Henry collected it in Yunnan, about 1000 miles west of Hongkong. The Indian ***Quercus polystachya***, found in Yunnan by Dr. Henry, has been recently collected in Hongkong. Neither of these plants has been collected at any place between these two points, so far as I know. ***Lasia heterophylla***, a Cingalese and Indian plant, comes as far east as Tai-mo-shan in the New Territory, and it has been found on the island of Cheung I, just outside of Hongkong harbour, but it has not been found in Hongkong itself. Additional species are constantly being found, and not a year passes but some plant is added to the Flora. Botanizing in Hongkong is a very difficult business, and it will be many years before our knowledge of its Flora is complete. It is quite impossible to get up many of the ravines on account of the huge boulders that block the way. To proceed up the sides one has often to cut a way through masses of Bamboo and strong-growing creepers and shrubs. Many of the sides of the hills are almost perpendicular, and after cutting a path through to a likely spot, one is often confronted with a perpendicular rock which bars all progress. The only thing to do is to make the assault from another direction; but this will give some idea of how it is species are being constantly added to the Flora and the difficulty of the collector.

Ferns are represented by over 100 species and grasses by nearly as many. There are between 90 and 100 species of Leguminosæ, and between 70 and 80 of Cyperaceæ. The Composites are between 60 and 70 and Orchids about 60. Although many additions are found in almost inaccessible places, others, on the other hand, are obtained in the most unlikely places, such as alongside public roads which are traversed daily. *Sloanea hongkongensis*, for instance, grows quite close to and overhangs a road leading from Mt. Victoria to Aberdeen, a village on the south side of the island. *Lagerstrœmia Fordii*, which was first discovered on the island of Lantao, grows close to the road leading from Pokfulum to Aberdeen. A curious instance of overlooking a species which had been found by Champion 50 years ago may here be noticed. Champion stated that *Quercus Eyrei* was abundant in the Wong-nei-cheong wood, east of the Happy Valley; but some years later Hance said he could not understand Champion making such a statement, as he could not find the plant there at all, and came to the conclusion that an oak which he found in the Happy Valley wood was the species Champion referred to. Hance's error is pointed out by Skan in the 'Index Flora Sinensis,' where Hance's plant is described as *Quercus alternata*. All other collectors as well as Hance were unable to find Champion's plant, and the only specimens known were those in the Kew Herbarium. In the spring of last year I was looking up the Hongkong Oaks, and wanted to get living specimens of as many as possible, as some of them were not in the Hongkong Herbarium, so I thought I could not do better than look for *Quercus Eyrei* in the wood mentioned by Champion, where to my surprise I found it without difficulty. It was quite common in the wood, many of the trees being 30 feet high, and some of them overhanging the public road. *Mucuna macrobotrya*, stated by Hance to grow near the Buddhist Temple, Causeway Bay, I have never been able to find, although I have often looked for it.

The general aspect of the Hongkong Flora is that of a more northern latitude, although most of the species are tropical.

This is in a great measure due to the abundance of the Pine-tree, which is by far the commonest tree in the island. Generally speaking, the shrubs and trees have a stunted appearance, and that luxuriance which one associates with the tropics is entirely wanting. This is accounted for by the poorness of the soil, which is nearly all disintegrated granite, and makes it all the more remarkable that so large a number of species should be found on such a small island. Showy flowering shrubs and creepers are exceedingly numerous and the flowers are produced in the greatest abundance. In every month of the year the hillsides are bright with something or other.

Perhaps there are more shrubs in flower in April and May than at any other time, but even in December and January there are such things as *Eurya japonica*, *Eurya Macartneyi*, and *Litsea citrata* in flower. *Eurya japonica* is a most evil-smelling plant when in flower, and it is not at all uncommon to hear people complain of the bad drains when they pass a specimen of it, as it has exactly that kind of smell. That it will give some people "drain-throat" I can testify, having suffered from it myself in this way.

The New Territory, in which is included the island of Lantao, leased to Great Britain by China in 1898 has an area of about 300 square miles, or ten times the area of Hongkong. The general features are those of Hongkong on a larger scale, as there are several mountain-ridges split up into numerous peaks, the highest of which is Tai-mo-shan, 3000 feet. Between these ridges are several valleys which are highly cultivated. Looking at the southern boundary of the New Territory from Hongkong, it appears almost as barren as Aden, but on closer inspection it is found that there are numerous ravines in which there is a considerable amount of vegetation. Lantao is an island something like Hongkong, the highest peak of which rises to 3050 ft. Many of the ravines are well-wooded and will, no doubt, yield many interesting plants when thoroughly explored, and the same may be said of the ravines on the mainland. *Rubus hexagynus*, an Indian species, has been found on Tai-mo-shan, but nowhere else in China. *Rhododendron Championi* was considered to be confined to Hongkong until it was discovered on one of the hills in the New Territory last year. *Uncaria hispida* was found in Lantao a few years ago and in Hongkong last year, but it is not known from elsewhere in China. *Gironniera* *nitida*, first discovered in Hongkong, was found in Lantao a few years ago, but it is not known from elsewhere. *Rhododendron Fordii* and *Rhododendron Westlandii* have not been found out of Lantao. This gives some idea of what an interesting ground the New Territory is likely to prove.

ECONOMIC BOTANY.

Tree-planting has been carried out on a considerable scale in Hongkong, but owing to the poorness of the soil it has been confined principally to one species, *Pinus Massoniana*. Many other kinds of trees have been tried but without success, unless in particularly favoured situations. A beginning has also been made in the New Territory, and this will probably be considerably extended.

There is very little land suitable for agriculture in Hongkong, but in the New Territory there are some fine level tracts, and there sugar and rice are the principal crops. Within the last few years improved varieties of sugar-cane have been introduced by the Government and are proving a success. Since the British occupation pineapple cultivation has greatly extended on the southern slopes of Tai-mo-shan and on the island of Cheung I. Experimental cotton-growing has been taken up within the last year, but I am not in a position to state with what result.

ILLICIUM DUNNIANUM, *Tutcher*, n. sp.

Frutex 3–4-pedalis. Folia verticillata, lanceolata, acuminata, 4–5 poll. longa, ¾–1 poll. lata, supra glabra, subtus pallida; petioli crassi, ½ poll. longi, purpurei. Flores solitarii in axillis foliorum dispositi, pedicellis ¾ poll. longis (post anthesin longioribus); bracteæ purpureæ, maximæ circiter 1 lineam longæ. Perianthii segmenta 17, inæqualia, minute ciliolata, minima 1½ lineas longa, maxima 4½ lineas longa et 3 lineas lata, obtusa, incurva, extus purpurea vel rubella, intus luteo-rubella. Stamina 24, biseriata, antheris filamentis fere æquilongis. Carpella 12, rostrata. Fructus non visus. (Herb. Hongkong Bot. Gard. n. 966.)

This species differs from *Illicium micranthum*, Dunn, in having twice the number of stamens and in the greater number of carpels.

The above plant was found growing gregariously on the banks of a stream at Sam-tam-lo in the British New Territory, Kowloon, in March 1903, and I have named it after Mr. S. T. Dunn, F.L.S., Superintendent of the Botanical and Afforestation Dept., Hongkong, from whom I have received every assistance and encouragement in any botanical work I have undertaken.

CAMELLIA BANKSIANA, *Lindl.* ?

I have been unable to find a complete description of this plant, but Champion in the 'Kew Journal of Botany,' vol. iii. p. 310, says:—"*Camellia Banksiana*, Lindl., is, I believe, a Hongkong species, but unknown to me. Some specimens found on a hill near Mount Parker, and sent home by Mr. J. Bowring previous to my arrival, were considered as belonging to the *C. Banksiana*. Mr. Bowring mentioned its having sweetly-perfumed flowers, so that it could scarcely be the same as the *C. assimilis*, of which the flowers are scentless, notwithstanding a general affinity in habit and in the white pendulous flowers."

Several specimens of a *Camellia* which were found on Mt. Parker in December, 1903, were referred by me to *C. assimilis*, but Mr. Dunn pointed out that they differed from that species, and on further examination I concurred with him. The specimens differ from *C. assimilis* in having the styles free for a greater distance, the capsule silky-hairy instead of glabrous, the flowers sweet-scented, and in the hairiness of the stamens. From Champion's description quoted above, I am inclined to believe that the specimens belong to *C. Banksiana*. (Herb. Hongkong Bot. Gard. n. 968.)

CAMELLIA CRAPNELLIANA, *Tutcher*, n. sp.

Arbor parva, 15–20-pedalis, ramis cortice lateritio-purpuraceis, ramulis glabris. Folia 4–5 poll. longa, 1½–2 poll. lata, obovata, emarginate acuminata, serrulata, revoluta, glabra, subcoriacea, venis subtus conspicuis; petioli crassi, circiter ⅓ poll. longi. Flores in apicibus ramulorum, solitarii, sessiles, albi, 3–4 poll. diametro. Bracteæ orbiculatæ, extus sericeæ. Sepala orbiculata, extus sericea. Petala 6–8, obovata, extus leviter sericea. Styli 3, distincti, glabri. Ovarium lanatum. Fructus ignotus. (Herb. Hongkong Bot. Gard. n. 967.)

This species differs from *Camellia reticulata*, Lindl. in having free, glabrous styles.

One tree only found on the south side of Mt. Parker in April 1903, but not in flower then. When visited again in the early part of December in the same year, the flowers were just beginning to fade. The brick-coloured bark of this tree makes it a very conspicuous object at a distance, and it was by this means that it was discovered.

Named after Mr. A. E. Crapnell, Hongkong, who has often accompanied me on my botanical excursions.

Zanthoxylum ovalifolium, *Wight* ?

Specimens of, apparently, this species were found on the southern slope of Mt. Parker in April, 1903. They differ from the description of *Z. ovalifolium* in the rusty-tomentose inflorescence and much thinner (papery) leaves. Further specimens are required before the species can be determined with certainty. (Herb. Hongkong Bot. Gard. n. 965.)

Chisocheton hongkongensis, *Tutcher*, n. sp.

Arbor parva, circiter 12-pedalis. Folia 1 ped. longa; petioli 6 poll. longi. Foliola 12–16, 4–6 poll. longa et 2–2½ poll. lata, oblonga, papyracea, opposita vel subopposita, obtusa vel emarginata, supra glabra, subtus opaca, basi oblique acuta vel rotundata, margine anguste revoluta; nervi 8–12-dupli; petioluli ¼ poll. longi. Ramuli juniores fulvo-pubescentes. Flores paniculati, 2 lineas longi; paniculæ ad apices ramulorum, axillares, erectæ, 5–6 poll. longæ. Calyx 5-dentatus, pubescens. Petala 5, valvata, alba, extus pubescentia. Staminorum tubus truncatus extus intusque sericeus. Antheræ 8, sessiles, in tubo inclusæ. Stylus glaber; ovarium pubescens. Fructus maturus glaber, pyriformis, 1½ poll. diametro. Semina oblonga, castanea, arillata, fere 1 poll. longa. (Herb. Hongkong Bot. Gard. n. 969.)

The fruits of this plant are somewhat like those of *Chisocheton patens*, Blume, but the mode of inflorescence and the flowers, which are 5-merous instead of 4-merous, are quite different. It appears to be a very distinct species.

Discovered on the south side of Mt. Parker in April, 1903, in fruit, but flowering specimens were not obtained until December of the same year. The genus has not previously been recorded from China.

MUCUNA CHAMPIONI, *Benth.*

The bracts of this species have not been noticed before, so far as I am aware. They are four in number at each node of the raceme, dark purple, broadly ovate and hairy on both surfaces. The outermost bract is the largest, 1¼ in. long, and covers the three others, which are somewhat smaller. The bracteoles are two to each flower, the same colour as the bracts, and hairy on both sides, narrow ovate or lanceolate in shape and about ¾ inch long. Both the bracts and bracteoles are very deciduous. The racemes are produced on the previous year's growths, and not on the very old wood as is the case with some other species of the genus. The leaflets are stipellate.

MUCUNA BIRDWOODIANA, *Tutcher*, n. sp.

Frutex sempervirens, alte scandens, ramulis ultimis ferrugineo-pubescentibus. Folia trifoliata, subcoriacea; petioli 3–4 poll. longi. Foliola petiolulata, exstipellata, ovato-oblonga (lateralia obliqua), breviter acuminata, 4–6 poll. longa et 2-2¾ poll. lata, supra glabra, subtus leviter pubescentia. Bracteæ 1 lin. longæ, ovatæ, citissimo deciduæ; bracteolæ 3 lineas longæ, ovatæ, cito deciduæ, ferrugineo-pubescentes. Flores eburnei, 3-3½ poll. longi, carnosi, racemosi, racemis 1–1¼ ped. longis, 20–30-floris, in ramis vetustioribus fasciculatis interdum in ramis junioribus productis, pedicellis ½ poll. longis, crassis, ferrugineo-pubescentibus. Calycis tubus fere ½ poll. longus, extus et intus ferrugineo-pubescens, limbo bilabiato, labio superiore ¼ poll. longo integro vel interdum bidentato, labio inferiore trilobato, lobis triangularibus infimo ½ poll. longo, lateralibus infimo brevioribus. Vexillum 1¾ poll. longum; alæ 2¾ poll. longæ; carina 3–3½ poll. longa, unguiculata; margines vexilli et alarum ciliolatæ. Legumen lignosum, pubescens, 9–10 poll. longum, 1½ poll. latum, inter semina leviter constrictum suturis ambobus bicanaliculatis; semina 5–6. (Herb. Hongkong Bot. Gard. n. 980.)

This species differs from *Mucuna macrocarpa*, Wall., in the colour of the flowers and in the shorter, hairy pod. It has been confused with *Mucuna macrobotrys*, Hance, from which it differs in the colour of the flowers and in the entirely different pod.

The plant was found many years ago by Mr. Ford on Mt. Parker, and last year (1903) I found it at the same place, as well as on Mt. Gough, flowering in April, and previously on Tai-mo-shan in the New Territory, in fruit.

It is named out of compliment to Colonel Birdwood, 110th Mahratta Light Infantry, an enthusiastic botanist, who has contributed many specimens to the Hongkong Botanic Garden.

ARISTOLOCHIA THWAITESII, *Hook. f.*

This plant is figured in the 'Botanical Magazine' under t. 4918, and is stated to be a native of Ceylon. Under t. 5295 in the same work this habitat is said to be wrong, and under t. 5908 Old Calabar is given as the native place of the species. Many years ago Mr. Ford collected the plant in Hongkong, but no specimens can be found at Kew from that place, although there are specimens in the Herbarium of the Hongkong Botanic Gardens collected by Mr. Ford. Last year (1903) I found several specimens growing under Bamboos in a wood on the south side of Wong-nei-cheong village, and later on many other plants were found growing in crevices of the almost perpendicular cliffs of the Black Mountain, a place which is still likely to yield additions to the flora of the island, as several have been made from that district during the last year or so. (Herb. Hongkong Bot. Gard. n. 979.)

BRIDELIA BALANSÆ, *Tutcher*, n. sp.

Arbor 15–20-pedalis; caudex spinosus, spinis 1–1½ poll. longis, crassis. Folia 3–4 poll. longa, oblonga, acuminata, acuta, leviter revoluta, basi attenuata, supra glabra, subtus glauca, venis primariis lateralibus 8–10; petioli ¼ poll. longi. Flores ♀ parvi, pedicellati, dense glomerati, in axillis foliorum dispositi, pedicellis crassis, rugulosis, 1 lin. longis, calycis lobis deltoideis extus intusque pubescentibus, 1 lin. longis. Flores ♂ non visi. Fructus ovoideus, purpureo-niger, fere ½ poll. longus. (Herb. Hongkong Bot. Gard. n. 974.)

This plant has been confused in the Hongkong Herbarium with *Bridelia tomentosa*, Blume, from which it is quite different in foliage and fruit. Balansa found the plant in Tonkin and his specimens in the Kew Herbarium bear the numbers 4122, 4123, and 4124.

In Hongkong I know of only two trees, one in the Happy

Valley Woods above the Bowen Road, and the other in a wood on the southern slope of Mt. Parker.

CLEIDION JAVANICUM, *Blume.*

One specimen only of this species was found in a ravine south of Sheko Gap in February of this year (1904). Not previously recorded from China. (Herb. Hongkong Bot. Gard. n. 963.)

FICUS ALTISSIMA, *Blume.*

It is difficult to say whether this is a native of Hongkong or not, but there are several fine specimens in the island and on the Kowloon peninsula. Hance found it in the province of Kwangtung near temples, and Dr. A. Henry collected it in Hainan. (Herb. Hongkong Bot. Gard. n. 970.)

FICUS INFECTORIA, *Roxb.*

This species is frequently met with in Hongkong and is, apparently, indigenous, although frequently planted for shade purposes. Dr. A. Henry states that it is commonly planted near shrines in China, but that he did not meet with it east of Patung in Hupeh.

QUERCUS ITEAPHYLLA, *Hance.*

Fruits of this species were collected in March of this year (1904) from trees growing in the woods on the east side of the racecourse, Wong-nei-cheong, and others from trees found on the hills above the Buddhist Temple, Causeway Bay. It belongs, as Hance suspected, to the section *Pasania*. The cup is scarcely 6 lines in diameter and 3 lines deep, silky on the inside. The connate bracts are in 6 to 8 series. The acorn is ovoid, glabrous, about 7½ lines long including the umbo, which is ½ line. (Herb. Hongkong Bot. Gard. n. 982.)

QUERCUS POLYSTACHYA, *Wall.*

Three trees of this species, about 20 feet high, were found on the Black Mountain in February of this year (1904). Previously collected by Dr. A. Henry at Mengtze in Yunnan, but not recorded from any other place in China. The acorns in the Hongkong specimens are about ¾ in. in diameter, somewhat larger than those collected in other places. (Herb. Hongkong Bot. Gard. n. 981.)

Castanopsis Eyrei, *W. J. Tutcher.* (*Quercus Eyrei*, Champ. ex Benth. in Hook. Kew Journ. Bot. vi. (1854) p. 114.)

This plant was described in the 'Kew Journal of Botany' fifty years ago, but when its description was made out Bentham had not seen the female flowers or fruits, and although Champion states that the tree was abundant in the Wong-nei-cheong wood on the east side of the Happy Valley, it apparently has never been again collected until last March (1904). This appears the more remarkable when it is stated that the tree is still common in the wood referred to by Champion and that specimens about 30 feet high overhang the public road, which must have been used by various collectors from time to time. At the time of my visit the trees were past fruit, but I was successful in finding a part of an involucre which was sufficient to prove that the plant belongs to *Castanopsis* as constituted at present. This fragment showed the iuvolucre to be about $\frac{3}{4}$ in. long with about 5 rows of compound spines. Better material is needed before a complete description of the fruit can be given.

Alsophila podophylla, *Hook.*, var. procumbens, *Tutcher*, n. var.

Caudex procumbens, 10 poll. longus et 2 poll. diametro, frondibus pinnatis, 2–$2\frac{1}{2}$ ped. longis, stipite 1–$1\frac{1}{2}$ ped. longo. (Herb. Hongkong Bot. Gard. n. 977.)

Specimens of this fern were found in a ravine on the south side of Sheko Gap, in February 1904. It was found previously by Balansa, no. 33 (in Kew Herbarium), in Tonkin. It struck me as being a new species on account of the procumbent caudex and the simply-pinnate fronds; but Mr. C. H. Wright, of the Herbarium, Royal Gardens, Kew, considers it to be a variety of *Alsophila podophylla* only.

I may mention that there were no specimens of typical *A. podophylla* seen in the locality where these plants were collected. Young plants of true *A. podophylla* assume an upright position and produce bipinnate fronds at a very early stage, but it is several years before they bear fertile fronds.

Polypodium (§ Phymatodes) Mathewii, *Tutcher*, n. sp.

Rhizoma repens, gracile, squamis castaneis lanceolatis. Stipes gracilis, fere niger, glaber, 1–2 poll. longus. Frons ovata,

integra, obtusa, $\frac{1}{3}$–$\frac{2}{3}$ poll. longa, $\frac{1}{4}$–$\frac{1}{3}$ poll. lata, subcoriacea, supra et subtus nuda, margine revoluta, costa et venis primariis lateralibus conspicuis intra margines anastomosantibus, areolis et venulis tenuissimis, soris 2–3, majusculis, uniseriatis inter costam et marginem propius ad costam quam marginem. (Herb. Hongkong Bot. Gard. n. 854.)

This small fern was collected in Wei-hai-wei by Staff-Surgeon C. G. Mathew, R.N., of H.M.S. 'Eclipse,' who has presented useful collections of plants from Corea, Wei-hai-wei, and Shanghai to the Hongkong Herbarium. He has also made several additions to the Flora of Hongkong.

Mr. C. H. Wright has kindly informed me that the species is near *P. oodes*, Kunze. It is much smaller than *P. oodes* and the sori are in series instead of being scattered.

GYMNOGRAMME ELLIPTICA, *Baker*, var. FURCANS, *Tutcher*, n. var.; pinnis superioribus multo furcatis, inferioribus multo incisis.

Several plants were found in a ravine on the south side of Mt. Parker in December, 1903.

POSTSCRIPT.

Dunnia, gen. nov. Rubiacearum, *Tutcher*.

Frutex 5-pedalis, ramis crassis, ramulis junioribus pubescentibus. Folia opposita, oblanceolata, breviter acuminata, 8 poll. longa, 2 poll. lata, brevissime petiolata vel sessilia, supra glabra, subtus opaca, costa venisque leviter pubescentibus, venis primariis lateralibus utrinque 16–20, conspicuis, intra margines anastomosantibus, venulis reticulatis. Stipulæ latæ, laciniatæ, persistentes, pubescentes. Flores cymosi; cymæ corymbosæ, terminales. Calycis lobi 5, minuti, acuti, persistentes; circiter unum lobum bracteiforme in omni cymula; lobus bracteiformis albus, ovatus. Corolla? Fructus capsularis; capsula crustacea, globosa, $\frac{1}{8}$ poll. diam., septicide dehiscens, 2-valvis, valvis 2-partitis. Semina numerosa, orbicularia, peltata, fimbriata, rugulosa, $\frac{1}{2}$ lin. diam.

This genus has affinity with *Emmenopterys* and *Mussændopsis*. It differs from both in having persistent calyx-lobes

and in the fruit and seeds. It also differs from *Emmenopterys* in its persistent stipules.

DUNNIA SINENSIS, *Tutcher*, species unica. (Herb. Hongkong Bot. Gard. n. 910.)

This plant was found by Mr. Dunn's native collector at Sanning, Kwangtung, last year (1904). The specimens were in fruit only.

17 February, 1905. W. J. T.

A Revised Classification of Roses, 1905.

By JOHN GILBERT BAKER, F.R.S., F.L.S.

[Read 16th February, 1905.]

THREE valuable Rose-monographs which have recently been published to a large extent fill the gap which was left by the long-expected monograph of the late Professor Crépin never having been completed. These are Dr. Keller's account of the Roses, in Ascherson & Graebner's 'Synopsis of the Flora of Central Europe'; the very careful and elaborate account of the French Roses, in Rouy & Foucaud's new 'Flora of France'; and Dr. Focke's description of the Roses, in the third edition of Koch's 'Synopsis,' now in course of publication under the editorship of Dr. Hallier. Reference should also be made to Dr. Christ's book on the Swiss Roses, and his account of the Oriental Roses in the supplementary volume of Boissier's 'Flora Orientalis,' and to Burnat & Gremli's 'Roses des Alpes Maritimes,' and its Supplement, and to Burnat's 'Flore des Alpes Maritimes.' The consensus of opinion in all recent investigators of the genus points to the conclusion that a great deal of the difficulty that arises is due to the facility with which Roses hybridise. I have therefore drawn up the following Catalogue of the species, varieties, and principal hybrids, to replace that which I contributed to the 'Gardeners' Chronicle' twenty years ago, and was printed in that journal, August 15, 1885, p. 199, and reprinted in the 'Journal of Botany' for the same year, pp. 281–286.

Analytical Key to the Groups.

Leaves simple, exstipulate	I. **Simplicifoliæ.** [1]
Leaves compound, stipulate.	
Styles united in a column which is protruded beyond the disk	II. **Systylæ.** [10]
Styles free, not much protruded.	
Stipules free, deciduous	III. **Banksianæ.** [3]
Stipules adnate to the petiole.	
DIACANTHÆ. Prickles often in stipular pairs.	
Fruit persistently hairy. Bracts crowded, deeply incised	IV. **Bracteatæ.** [2]
Fruit glabrous.	
Hip green, with a thick skin	V. **Microphyllæ.** [1]
Hip red, with a thin skin	VI. **Cinnamomeæ.** [21]
HETERACANTHÆ. Prickles scattered, very unequal.	
Larger prickles long, slender, straight	VII. **Spinosissimæ.** [8]
Larger prickles hooked, stout	VIII. **Gallicanæ.** [2]
HOMOCANTHÆ. Prickles scattered, uniform.	
Leaves glabrous or slightly hairy	IX. **Caninæ.** [8]
Leaves very hairy	X. **Villosæ.** [5]
Leaves very glandular beneath	XI. **Rubiginosæ.** [8]

The numbers in the brackets following the names are the number of primary species they contain.

PRIMARY SPECIES.	SUBSPECIES AND VARIETIES.	PRINCIPAL HYBRIDS.
Group I. **Simplicifoliæ.**		
1. R. SIMPLICIFOLIA, Salisb.—Orient. (*R. berberifolia*, Pall.)		*R. Hardii*, Cels. (*simplicifolia* × *involucrata*).
Group II. **Systylæ.**		
2. R. ARVENSIS, Huds.—Europe. (*R. repens*, Scop.)	*R. capreolata*, Neill.	*R. perviridis*, Gren. (*arvensis* × *sempervirens*). *R. rusticana*, Déségl. (*arvensis* × *stylosa*). *R. Melsini*, Towndr. (*arvensis* × *canina*).
3. R. SEMPERVIRENS, Linn.—South Europe.	*R. scandens*, Miller. *R. prostrata*, DC. *R. longicuspis*, Bert.—India.	
4. R. LESCHENAULTIANA, Wight & Arn.—Neilgherries.		
5. R. MOSCHATA, Herm.—S. Europe, N. Africa, Asia.	*R. Brunonis*, Lindl. *R. Pissardi*, Carrière—Persia. *R. abyssinica*, R. Br.—Abyssinia.	*R. nivea*, Duport. (*moschata* × *gallica*).
6. R. PHŒNICEA, Boiss.—Orient.		*R. byzantina*, Dieck. (*phœnicea* × *gallica*).
7. R. MULTIFLORA, Thunb.—Japan.	*R. Luciæ*, Franch. & Savat.	*R. anemonæflora*, Fortune. (*multiflora* × *Banksiæ*). *R. polyantha*, Hort. (*multiflora* × *indica*).
8. R. WICHURÆANA, Crépin—Japan.		*Wichuræana* × *rugosa* and many others.
9. R. WATSONINANA, Crépin—Japan.		
10. R. SETIGERA, Michx.—N. America.		*setigera* × *gallica*.
11. R. STYLOSA, Desv.—Europe. (*R. systyla*, Bast.)	*R. virginea*, Ripart.	

Primary Species.	Subspecies and Varieties.	Principal Hybrids.
Group III. **Banksianæ.**		
12. R. BANKSIÆ, R. Br.—China.		
	R. lutea, Hort.	
	R. Collettii, Crépin—Birma.	
		R. Fortuneana, Lindl. (*Banksiæ* × *lævigata*).
13. R. MICROCARPA, Lindl.—China. (*R. indica*, L., ex parte.)		
14. R. LÆVIGATA, Michx.—China. (*R. sinica*, Lindl., non Ait.)		
		Anemone (*lævigata* × *indica*).
		Marie Leonidas (*lævigata* × *bractescens*).
Group IV. **Bracteatæ.**		
15. R. INVOLUCRATA, Roxb.—Ind. Or. (*R. Lyellii*, Lindl.) (*R. clinophylla*, Thory.)		
16. R. BRACTESCENS, Wendl.—China. (*R. lucida*, Lawr. non Ehrh.)		
Group V. **Microphyllæ.**		
17. R. MICROPHYLLA, Lindl., non Retz.—China.		
Group VI. **Cinnamomeæ.**		
Old World.		
18. R. CINNAMOMEA, Linn.—Europe, N. Asia. (*R. majalis*, Herm.) (*R. davurica*, Pallas.)		*R. francofurtana*, Munch. (*R. turbinata*, Ait.) (*cinnamomea* × *gallica*).
19. R. MACROPHYLLA, Lindl.—Himalayas, China. (*R. Davidi*, Crépin.)		
20. R. PRATTII, Hemsl.—Tibet.		
21. R. SERICEA, Lindl.—Himalayas, &c. (*R. tetrapetala*, Royle.)		
22. R. WEBBIANA, Wall.—Himalayas.		
23. R. ACICULARIS, Lindl.—N. Europe, N. Asia, N. America. (*R. carelica*, Fries.) (*R. Gmelini*, Bunge.) (*R. Engelmanni*, S. Wats.)		
	R. nipponensis, Crépin.	

PRIMARY SPECIES.	SUBSPECIES AND VARIETIES.	PRINCIPAL HYBRIDS.
Cinnamomeæ (*cont.*).		
Old World.		
24. R. LAXA, Retz. non Lindl.—Siberia.		
25. R. FEDSCHENKOANA, Regel—Turkestan.		
26. R. BEGGERIANA, Schrenk—Central Asia.		
	R. anserinæfolia, Boiss.	
27. R. ELYMAITICA, Boiss.—Persia.		
28. R. RUGOSA, Thunb.—Japan &c.		
	R. kamschatica, Vent.	
		R. Iwara, Sieb. & Zucc. (*rugosa* × *multiflora*). *R. calocarpa*, André. (*rugosa* × *indica*), and many others.
New World.		
29. R. CAROLINA, Linn.—Eastern States. (*R. hudsoniana*, Thory.)		
30. R. VIRGINIANA, Miller, non K. Koch—Eastern States. (*R. lucida*, Ehrh.)		
31. R. HUMILIS, Marsh.—Eastern States. (*R. parviflora*, Ehrh.)		
	R. lancifolia, Small.	
32. R. NITIDA, Willd.—North-eastern States.		
33. R. FOLIOLOSA, Nutt.—Texas and Arkansas.		
	R. mexicana, S. Wats.—Mexico.	
34. R. GYMNOCARPA, Nutt.—Western States.		
35. R. CALIFORNICA, Cham. & Schlecht.—California.		
	R. piscicarpa, A. Gray.	
36. R. WOODSII, Lindl.—Rocky Mountains.		
37. R. FENDLERI, Crépin—Rocky Mountains.		
38. R. NUTKANA, Presl—N.W. America.		
Group VII. **Spinosissimæ.**		
39. R. EGLANTERIA, Linn.—Orient. (*R. lutea*, Miller.)		
	R. punicea, Miller.	

Primary Species.	Subspecies and Varieties.	Principal Hybrids.
40. R. HEMISPHÆRICA, Herm.—Orient.		
(*R. sulphurea*, Ait.)		
	R. Rapini, Boiss.	
41. R. PLATYACANTHA, Schrenk—Central Asia.		
(*R. xanthina*, Lindl. ?, Crépin.)		
	R. Ecæ, Aitch.	
42. R. SPINOSISSIMA, Linn.—Europe, N. Asia.		
(*R. pimpinellifolia*, Linn.)		
	R. altaica, Willd.—Siberia.	
	(*R. grandiflora*, Lindl.)	
	R. Alberti, Regel—Turkestan.	
	R. myricantha, DC.—S. Europe.	
	R. hispida, Sims—Siberia.	
	(*R. lutescens*, Pursh.)	
	R. rubra, Hort.	
		R. rubella, Sm.
		(*R. gentilis*, Sternb.)
		(*R. reversa*, Waldst. & Kit.)
		(*spinosissima* × *alpina*).
		R. involuta, Sm.
		(*R. Sabini*, Woods.)
		(*R. coronata*, Crépin.)
		(*R. Robertsoni*, Baker.)
		(*R. Wilsoni*, Borr.)
		(*spinosissima* × *tomentosa*).
		R. dichroa, Leresch.
		(*spinosissima* × *mollis*).
		R. sabauda, Rapin.
		(*spinosissima* × *glauca*).
		R. hibernica, Sm.
		(*R. Schultzii*, Ripart.)
		(*spinosissima* × *canina*).
		R. biturigensis, Boreau.
		(*spinosissima* × *rubiginosa*).
43. R. ALPINA, Linn.—Central Europe.		
	R. pyrenaica, Gouan.	
	R. Malyi, Kerner.	
	R. oplisthes, Boiss.—Caucasus.	
44. R. MINUTIFOLIA, Engelm.—S. California.		
45. R. STELLATA, Wootton—New Mexico.		

PRIMARY SPECIES.	SUBSPECIES AND VARIETIES.	PRINCIPAL HYBRIDS.
Spinosissimæ (*cont.*)		
46. R. BLANDA, Ait.—N. America.		
(*R. virginiana*, K. Koch, non Miller.)		
	R. laxa, Lindl., non Retz.	
	R. fraxinifolia, Borkh.	
	R. Willmottiana, Baker.	
	R. Sayi, Schwein.	
	R. arkansana, Porter.	
		blanda × *rugosa*.
Group VIII. **Gallicanæ.**		
47. R. GALLICA, Linn.—Central and South Europe.		
	R. provincialis, Miller.	
	R. centifolia, Linn.	
	R. muscosa, Miller.	
	R. pomponia, DC.	
	R. parvifolia, Ehrh.	
		R. damascena, Miller. *R. bifera*, Poir. (*gallica* × *moschata*).
		R. arvina, Krock. *R. geminata*, Rau. *R. hybrida*, Schleich. *R. gallicoides*, Baker. *R. Polliniana*, Spreng. (*gallica* × *arvensis*).
48. R. SANCTA, A. Rich.—Abyssinia.		
Group IX. **Caninæ.**		
49. R. INDICA, Linn. ex parte—China.		
	R. semperflorens, Curt.	
	R. Lawrenceana, Sweet.	
	R. odoratissima, Sweet.	
	R. pseudo-indica, Lindl.	
	R. longifolia, Willd.	
		R. Bourboniana, Thory. (*indica* × *gallica*).
		R. Noisettiana, Thory. *R. floribunda*, Andr. (*indica* × *moschata*).
		R. reclinata, Thory. (*indica* × *alpina*).
		R. Ruga, Lindl. (*indica* × *arvensis*).

Primary Species.	Subspecies and Varieties.	Principal Hybrids.
50. R. GIGANTEA, Collett—Upper Birma, &c.		
51. R. CANINA, Linn.—Europe, West Asia.		
	R. caucasica, Pall.	
	R. dumalis, Bechst.	
	R. urbica, Leman.	
	R. dumetorum, Thuill.	
	R. Montezumæ, H. B. K.	
	R. obtusifolia, Desv.	
	and many others.	
		R. alba, Linn., *R. incarnata*, Miller, *R. collina*, Jacq., and many others. *R. macrantha*, Desf. (*canina* × *gallica*).
52. R. GLAUCA, Vill.—Europe. (*R. Reuteri*, Rapin.)		
	R. subcristata, Baker.	
	R. coriifolia, Fries.	
	R. Watsoni, Baker.	
	and many others.	
		R. salevensis, Rapin. (*glauca* × *alpina*).
53. R. TOMENTELLA, Leman—Europe.		
54. R. FERRUGINEA, Vill.—Central Europe. (*R. rubrifolia*, Vill.)		
55. R. MONTANA, Chaix—Central Europe.		
	R. rhætica, Keller.	
	R. abietina, Gren.	
	R. Chavini, Rapin.	
56. R. POUZINI, Tratt.—Southern Europe.		
	R. Diomedis, Gren.	
	R. Beatricis, Burn. & Gremli.	
	R. gallinaria, Burn. & Gremli.	
Group X. **Villosæ.**		
57. R. POMIFERA, Herm.—Central Europe. (*R. villosa*, Linn., ex parte.)		
	R. recondita, Puget.	
		R. Dicksoni, Lindl. (*pomifera* × *cinnamomea*).

Primary Species.	Subspecies and Varieties.	Principal Hybrids.
Villosæ (*con.*).		
58. R. MOLLIS, Sm.—Europe. (*R. mollissima*, Fries, non Willd.)		
59. R. ORIENTALIS, Dupont—Orient.		
60. R. TOMENTOSA, Sm.—Europe.	*R. subglobosa*, Sm. *R. scabriuscula*, Winch. *R. cinerascens*, Dumort. *R. omissa*, Déségl.	*R. spinulifolia*, Demar. *R. hawrana*, Knet. (*tomentosa* × *alpina*). *R. Mareyana*, Boul. (*tomentosa* × *gallica*).
61. R. HECKELIANA, Tratt.—Sicily to Greece.		
Group XI. **Rubiginosæ.**		
62. R. JUNDZILLI, Bess.—Central Europe. (*R. trachyphylla*, Rau.)		
63. R. RUBIGINOSA, Linn.—Europe.	*R. jemensis*, M. Schultz.	Lady Penzance (*rubiginosa* × *lutea*) and many others.
64. R. MICRANTHA, Sm.—Europe. (*R. nemorosa*, Libert.)	*R. micranthoides*, Keller. *R. hungarica*, Kerner. *R. Briggsii*, Baker.	
65. R. AGRESTIS, Savi—Central and Southern Europe. (*R. sepium*, Thuill.)	*R. elliptica*, Tausch. *R. graveolens*, Gren. *R. nodosa*, Fries (*R. Klukii*, Bess.). *R. caryophyllacea*, Bess. *R. arabica*, Crépin.	
66. R. GLUTINOSA, Sibth. & Sm.—Orient.	*R. sicula*, Tratt.—Sicily.	
67. R. SERAPHINI, Viv.—Corsica.		
68. R. FEROX, Bieb.—Crimea.		
69. R. ASPERRIMA, Godet—Persia.		

Geographical Distribution.—Five Roses are found south of the Tropic of Cancer, viz.: *R. moschata* and *R. sancta* in Abyssinia, *R. Leschenaultiana* in the Neilgherries, and *R. mexicana* and *R. Montezumæ*, H. B. K., in Mexico. The latter is only a form of *R. canina*, so probably it has been introduced. In the North Temperate Zone there are six well-marked Rose-regions, a considerable proportion of the species inhabiting each being endemic. These are:—(1) Europe, including North Africa; (2) the Orient, excluding the European countries included in Boissier's 'Flora Orientalis'; (3) Northern and Central Asia, including China and Japan; (4) India; (5) Western United States and Rocky Mountains; and (6) the Eastern United States. Of these districts the richest in Roses is Europe with North Africa, which has 29 species. North and Central Asia, including China and Japan, closely follows it, with 26 species. The other districts have much smaller numbers—the Asiatic portion of the Orient having 18, India 9, the Western United States 10, and the Eastern United States 6 species.

Contributions to the Flora of Liberia.

By Dr. Otto Stapf, F.L.S.

[Read 16th March, 1905.]

The subject of this paper includes a number of new species, some of them belonging to new genera, which were collected by Mr. Alexander Whyte in the Republic of Liberia during several expeditions undertaken by him last year on behalf of Sir H. H. Johnston acting for the Monrovian Rubber Company. As I wish to confine myself in this place to technical descriptions of the novelties in Mr. Whyte's collections, I abstain from an attempt to give a general account of the flora of Liberia, reserving that for another occasion. It may suffice to say that the collections were made in the following localities:—

(1) At Monrovia and in its vicinity, within a radius of 6 miles, in February during the dry season, the ground being described as covered with second forest-growth on abandoned farms, and as flat with many lagoons and backwaters.

(2) In the hinterland of Monrovia, within a radius of 20 miles of a place called Karkatown.

(3) In the basin of the Sinoe River, from Sinoe as far as Soyos' Town in the Kuru (or Kulu) country, about 80 miles inland, in March and April, during a period of extremely hot weather. "Physical features of the country flat and covered with dense virgin-forest, except where native gardens have been made and where the forest-growth rushes up with amazing rapidity. Rainfall very abundant; climate moist and humid all the year round. Country under water in very wet weather and travelling almost impossible, as no roads exist, or even traces of forest footpaths."

As there are no special labels with the specimens, I am obliged to give the localities in a summary way. The collections comprise over 260 species. To these Mr. D. Sim, an employee in the service of the Monrovian Rubber Company, also contributed; but as I have already described the novelties discovered by him in 'Flora of Tropical Africa,' vol. iv. pp. 595–610, his name does not appear in this paper*. Out of these 260 and odd species I have to record 4 new genera and 58 new species, or, including those described previously, 67 new species, certainly a very considerable percentage. This will, however, appear less surprising if we bear in mind that Liberia is, perhaps with the exception of the French Ivory Coast, the least explored part of the West-African littoral, and that up to 1904 not more than about 200 species were known from the whole territory of the Republic, the area of which is estimated at 36,800 square miles, or a little more than two-thirds the area of England. Moreover, almost the whole of the earlier collections were made at Grand Bassa and Cape Palmas, that is outside the districts explored by Whyte and Sim. That Liberia is likely to yield a great many new species is also suggested by the results of Mr. Dinklage's excursion to Grand Bassa and Cape Palmas in 1898, numerous new species having been described by the Berlin botanists from his collections. At the same time, it must be remarked that all the new species described here belong to types of a higher order, characteristic of the West-African flora, or extending over larger parts of the tropics. As might be expected, Liberia, to judge by the little we know, presents itself as a section, with rather artificial boundaries, of the great natural region which extends from the Senegal in the north to the Kunene in the south. Its flora has, no doubt, a strong local colouring, but it is rather of the specific than the generic order. Its nearest affinity is, of course, with Sierra Leone, and not a few of the species described here are representative forms of that country. Even three of the four new genera proposed by me are not endemic in Liberia. One, *Urobotrya*, extends to Sierra Leone, whilst the other two, *Atroxima* and *Afrodaphne*, range over a still greater portion of West Africa and comprise species hitherto referred to old genera.

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* See note on p. 115.

Finally, I have to remark that the whole of Whyte's and Sim's collections were presented to Kew by Sir H. H. Johnston, and to thank Mr. C. B. Clarke and my colleagues Messrs. N. E. Brown, T. A. Sprague, and C. H. Wright for their help in working out certain orders, and Dr. James Clark for his assistance in dissecting species which had to be taken into account for purposes of comparison.

The sequence of genera is that of Bentham and Hooker's 'Genera Plantarum.'

Tetraceras leiocarpa, *Stapf* (sp. nov.); affinis *T. potatoriæ*, Afz., a qua differt imprimis carpellis glaberrimis vel pilis paucis minutis aspersis, folliculis lævissimis, arillo magis lacerato, semine fere duplo majore.

Folia et *paniculæ* ut in *T. potatoria* nisi folia glabra vel subtus parcissime pilosa. *Sepala* 5–9, late rotundato-elliptica, majora 3 lin. longa, extus glabra vel sparse minute pubescentia margine ciliata, intus sericeo-tomentosa. *Petala* 2–3, elliptica, caducissima. *Carpella* circiter 4, glaberrima vel pilis paucis minutis aspersa. *Folliculi* obovoidei, abrupte in cuspidem (stylum persistentem) contracti, 3 lin. longi, lævissimi, nitidi, olivacei. *Semina* subglobosa, ad 2½ lin. dimetientia, testa rugosa, arillo pallido ad vel ultra medium lacerato, laciniis tenuibus.

Karkatown, *Whyte.*

The follicles of *T. potatoria* are very conspicuously sulcato-striate, and the largest seed I have seen was only 1½ lin. long.

Popowia Whytei, *Stapf* (sp. nov.); affinis *P. Vogelii*, Baill., differt foliis firmioribus subtus vix glaucis, floribus sericeo-tomentosis.

Ramuli floriferi 1½ lin. crassi, cortice atro-cinereo. *Folia* subelliptica, obtusa, 3½–6 poll. longa, 2–2½ poll. lata, subcoriacea, glabrescentia, supra pallide viridia, infra subglauca, nervis lateralibus 8–9 obliquis venarum reticulatione tenui; petiolus 2 lin. longus, crassiusculus. *Flores* 2–5, fasciculati; pedicelli bracteæque minutæ, fulvo-tomentosæ. *Sepala* late ovata, tenuiter tomentosa, ½ lin. paulo longiora. *Petala* exteriora vix 2 lin. longa, extus tenuissime tomentella, interiora dimidio minora, glabra, omnia crassa. *Stamina* 9; antheræ subsessiles, connectivo quadrato, obscure glanduloso, loculis lateralibus; staminodia nulla. *Carpella* numerosa, tomentosa, 2-ovulata.

Sinoe Basin, *Whyte.*

The leaves are, as in *Popowia Vogelii*, more or less pubescent when young, the fine adpressed and scattered hairs disappearing later on.

Kolobopetalum ovatum, *Stapf* (sp. nov.); affine *K. auriculato*, Engl., sed foliis ovatis basi rotundatis integris, paniculis robustioribus, filamentis 6 ad fere apicem in columnam brevissimam connatis distinctum.

Planta glaberrima. *Folia* ovata, basi rotundata, abrupte in acumen obtusiusculum contracta, ad 4 poll. longa, ad 2¼ poll. lata, tenuia, nervis lateralibus utrinque 4–5, infimis e basi ortis uti venis vix prominulis. *Paniculæ* ad 8 poll. longæ, divaricato-ramosæ, ramis infimis ad 2 poll. longis. *Flores* ♂ minuti, 1–2 in axillis bractearum lanceolato-caudatarum 1 lin. longarum; pedicelli pertenues, breves. *Sepala* 6, interiora longiora, late elliptica, ad ¾ lin. longa. *Petala* 6, obovata, apice rotundata, exunguiculata, ¼ lin. longa. *Filamenta* fere tota longitudine connata; antheræ loculis confluentibus transverse dehiscentes, valva interiore minore. *Flores* ♀ *fructusque* ignoti.

Sinoe Basin, *Whyte.*

Nymphæa Lotus, *L.*, var. **sinoëensis**, *Stapf* (var. nov.). *Folia* tenuia, integra. *Flores* vix 3 poll. diametro. *Sepala* extus ex toto vel præter marginem album pulchre violacea, ad 1⅓ poll. longa, ad 5 lin. lata.

Sinoe Basin, *Whyte.*

Alsodeia prasina, *Stapf* (sp. nov.); affinis *A. Afzelii*, Engl., differt floribus minoribus, calyce pro ratione majore, antherarum appendiculo cochleariformi.

Planta glaberrima. *Ramuli* novelli pallide virides. *Folia* oblonga vel oblongo-lanceolata, basi obtusa vel subacuta, apice acuminata, margine plerumque magis minusve serrata vel crenato-serrata, ad 8 poll. longa, ad 3 poll. lata, subcoriacea, pallide viridia, nervis lateralibus utrinque 7–10, venarum reticulatione subtus laxa, supra plerumque arctiore; petiolus ad 1 poll. longus. *Paniculæ* ad 3½ poll. longæ, fere a basi ramosæ; rami infimis exceptis ½ poll. vix excedentes; bracteæ parvæ, ovatæ, subscariosæ; pedicelli brevissimi. *Sepala* rotundato-ovata, interiora ad 1½ lin. longa, ciliolata, prominenter nervosa. *Petala* oblonga, 2 lin. longa. *Staminum* tubus brevis, truncatus, utrinque glaber; antheræ in tubi margine sessiles, cum connectivi appendice exteriore ovato 1 lin. longæ, appendiculo interiore rhomboideo cochleariformi.

Within 6 miles of Monrovia, *Whyte*.

Engler (in Bot. Jahrb. xxxiii. p. 140) enumerates Zenker's no. 1778 from Bipinde under *Alsodeia kamerunensis*, Engl., which is described as having a 5-lobed staminal tube with broad, deltoid, truncate lobes. The specimen at Kew from Zenker's collection, no. 1778, has a staminal tube very like that of *A. prasina*, and it also resembles it in other respects; but it differs in the nerves of the sepals not being raised and the hairiness of the inner side of the staminal tube and the edges of the bases of the thecæ.

Alsodeia Whytei, *Stapf* (sp. nov.); affinis *A. brachypetalæ*, Turcz., sed foliis minoribus, petiolis brevioribus tenuioribus, inflorescentiæ pubescentia tenuissima, antherarum thecis obscure mucronatis, connectivi appendice latiore acuto differt.

Ramuli pallide virides, minute puberuli vel glabri. *Folia* lanceolata vel elliptico-lanceolata, acuminata, basi subacuta, margine magis minusve serrulata, 2–4 poll. longa, 1¼–2 poll. lata, tenuia, utrinque glabra vel inferne in dorso sparse puberula, pallide viridia, nervis lateralibus utrinque 6–9 uti venis tenuibus; petiolus gracilis, 4–9 lin. longus. *Paniculæ* 1½ poll. longæ, pubescentes, breviter ramosæ; bracteæ ovatæ vel lanceolatæ, ad 1 lin. longæ; pedicelli ad 1½ lin. longi. *Sepala* late ovata, interiora ad 1½ lin. longa, tenuiter pubescentia, margine albido-ciliolato. *Petala* anguste ovato-oblonga, 2 lin. longa. *Staminum* tubus brevis, truncatus; antheræ in tubi margine sessiles, cum connectivi appendice ovato-lanceolato acuto fere 1½ lin. longæ, thecis minutissime mucronatis, mucrone pilosulo.

Within 6 miles of Monrovia, *Whyte.*

Alsodeia Johnstonei, *Stapf* (sp. nov.); affinis *A. kamerunensi*, Engl. (e descriptione), sed foliis tenuioribus lanceolatis, amœne viridibus, nervis lateralibus intra marginem eleganter arcuato-connectis, paniculis ovatis brevioribus, andrœcii tubi lobis ovatis distincta.

Ramuli juniores pubescentes, mox glabrati, fusci. *Folia* lanceolata vel oblongo-lanceolata, basi obtusa vel subacuta, acute acuminata, magis minusve serrulata vel subcrenata, ad 7 poll. longa, ad 2–2¼ poll. lata, amœne viridia, tenuia, glabra, nervis lateralibus utrinque 8–12 tenuibus eleganter arcuato-connectis, nervo collectivo 2–3 lin. a margine distante, venarum reticulatione tenui; petioli 2½–5 lin. longi, pubescentes. *Paniculæ* terminales, cum pedunculo brevi 1–3 poll. longæ, densiusculæ, glabræ vel subglabræ; bracteæ ovatæ, 1 lin. longæ; pedicelli ad 1½ lin. longi. *Sepala* ovata, obtusa, 1½–2½ lin. longa, tenuiter albo-marginata, cæterum exsiccata fusco-nigrescentia, glabra. *Petala* oblonga, 2–3 lin. longa. *Andrœcii* tubus brevis, 5-lobatus, lobis brevibus ovatis; antheræ intra lobos tubi sessiles, cum connectivi appendice lanceolato-acuto 2 lin. longæ, thecis ad apices contiguis. *Capsula* 9 lin. longa, glabra, apiculato-acuminata. *Semina* ambitu triangulari-obovata, compressa, ad 3 lin. longa.

Sinoe Basin, *Whyte.*

Oncoba brevipes, *Stapf* (sp. nov.); affinis *O. glaucæ*, Hook. f. (quoad plantam Beauvaisianam), sed foliis ad vel supra medium latissimis abrupte latiuscule obtuse acuminatis, breviter petiolatis, floribus haud carmineis diametro 4–5 poll. distincta.

Planta glaberrima, novellis resinosis. *Folia* elliptico-oblonga vel obovato-oblonga, subito in acumen brevem obtusum contracta, basi acuta, ad 7 poll. longa, ad 3¼ poll. lata, pallide viridia, haud glauca, nervis lateralibus obliquis utrinque 8–9, venis laxe reticulatis obscuris; petiolus ⅔–1 poll. longus. *Racemi* 2–3-flori, brevissime pedunculati; pedicelli subrobusti, ad 1¾ poll. longi. *Petala* circiter 10–12, obovato-lanceolata, cum ungue ad 2 poll. longo, ut videtur alba. *Antheræ* acutæ, 2½ lin. longæ.

Near Monrovia, *Whyte.*

ATROXIMA *, *Stapf* (gen. nov. Polygalacearum).

Affinis *Carpolobiæ*, G. Don, differt petalis subæqualibus, infimo haud naviculari, fructu duro, pericarpio crustaceo, seminibus endospermate destitutis.

Sepala 5 structura simillima, magnitudine inæqualia, interiora majora. *Petala* 5, subæqualia, lanceolata, haud unguiculata, infimum quam cætera vix vel paulo latius et ut ea leviter concavum, ima basi tubo staminali adnatum, duo summa multo altius et oblique adnata intusque infra medium sericeo-villosa. *Stamina* 5, monadelphia, tubo staminali in latere superiore tota longitudine fisso; antheræ sessiles vel filamentis distinctis insidentes. *Ovarium* sessile, 3-loculare, loculis 1-ovulatis; stylus filiformis; stigma punctiforme. *Fructus* subglobosus, durus; pericarpium crustaceum (more *Xanthophylli*). *Semina* subglobosa; testa tenuiter molliter pilosula; endosperma nullum. *Embryo* cotyledonibus crassis sectione transversa subsemiorbicularibus.

Arbuscula vel frutices, glabræ. Folia alterna, coriacea. *Flores* in racemis plerumque gracilibus longiusculis axillaribus, rarius paniculati.

Species notæ 4 in Africa tropica occidentali.

A. liberica, *Stapf* (sp. nov.); affinis *A. macrostachyæ*, Stapt (*Carpolobia macrostachya*, Chod.), sed foliis majoribus magis conspicue reticulatis, breviter petiolatis, inflorescentiis floribusque præter sepala ciliolata glabris distincta.

Ramuli graciles, cortice pallido. *Folia* oblonga, acuta vel subobtusa, apice subcaudato-acuminata acumine obliquo, 4–6 poll. longa, $1\frac{3}{4}$–$2\frac{1}{4}$ poll. lata, tenuiter coriacea, nervis lateralibus utrinque circiter 6 valde obliquis arcubus a margine 2–3 lin. distantibus connectis, reticulatione venarum arcta utrinque conspicua prominula; petioli crassiusculi, nigrescentes, 2 lin. longi. *Racemi* solitarii vel bini in axillis foliorum, circiter 2 poll. longi; bracteæ late ovatæ, minutæ; pedicelli 1 lin. longi. *Sepala* late ovata, obtusa, minute ciliolata, interiora 2 lin. longa. *Petala* 3 lin. longa. *Antheræ* sessiles.

Sinoe Basin, *Whyte.*

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* ἀτρόξιμος, not eatable; in allusion to the fruit.

The other species which I refer to *Atroxima* are:—

1. *A. Afzeliana*, Stapf (=*Carpolobia Afzeliana*, Oliver, in Fl. Trop. Afr. i. p. 136); 2. *A. macrostachya*, Stapf (=*Carpolobia macrostachya*, Chod. in Bull. Herb. Boiss. v. p. 117); 3. *A. Zenkeri*, Stapf (=*Carpolobia Zenkeri*, Gürke, MS.). As the latter is still undescribed, I add here a short diagnosis:—

Atroxima Zenkeri, *Stapf* (sp. nov.). *Ramuli* graciles. *Folia* elliptico-oblonga, basi breviter contracta acuta, apice abrupte acuminata, ad 5½ poll. longa, ad 2 poll. lata, tenuiter coriacea, nervis lateralibus utrinque circiter 7 uti venarum reticulatione tenuibus indistincte arcuato-connectis; petioli subgraciles, 2–3 lin. longi. *Racemi* 1–4 in axillis foliorum vel in ramulis nonnullis ob folia (rudimentaria?) præmature decidua quasi in paniculas collecti, griseo-pubescentes. *Flores* non nisi ex alabastris noti. *Fructus* ½ poll. diametro; pericarpium extus opacum, fusco-fulvum, intus nitens, ½–¾ lin. crassum. *Semina* 3 lin. diametro.

Cameroons: in primeval forest near Bipinde, *Zenker*, 1240.

The fruit of *Carpolobia*, as represented by the species *C. alba*, D. Don, and *C. lutea*, D. Don, is a true berry. The globose or subglobose seeds are covered with a rich silky tomentum, and possess an ample, fleshy albumen. The embryo consists of a very short subclavate radicle and two very thin foliaceous cotyledons almost as long and as wide as the seed.

Garcinia epunctata, *Stapf* (sp. nov.); affinis *G. punctatæ*, Oliver, differt foliorum glandulis canaliformibus nervos secundarios venasque transgredientibus longis tenuibus subundulatis (haud punctiformibus vel striiformibus), pedicellis robustioribus distinctis, floribus paulo majoribus, sepalis interioribus magnitudine minus diversis, phalangibus circiter 8-nas anthera gerentibus.

Folia oblonga vel elliptico-oblonga, basi acuta, apice abrupte caudato-acuminata (acumine ad ¾ poll. longo), ad 5 poll. longa, ad vel ultra 2 poll. lata, tenuiter coriacea, nervis secundariis numerosis, circiter 1 lin. distantibus obliquis ut venis tenuibus, glandulis canaliformibus nervos venasque transgredientibus longis tenuibus subundulatis, petiolus 2–3 lin. longus. *Flores* solitarii vel geminati; bracteæ parvulæ, latæ; pedicelli 1 lin. longi. *Sepala* 4 rotundata, pallide viridia, venosa, interiora majora, 2 lin. diametro. *Petala* 4 rotundato-elliptica, saturate lutea, ad 4 lin.

longa. *Stamina* (in ♂) in phalanges 4 antheras circiter 8-nas arcte approximatas distinctas gerentes collecta. *Ovarium* (in ♀) turbinato-globosum, 1½ lin. longum; stigma discoideum, margine minutissime crenulatum.

Sinoe Basin, *Whyte.*

The differences in the glandular system of the leaves of *Garcinia punctata* and *G. epunctata* are very striking, and can, without further preparation, be seen in young leaves by holding them up against strong light.

Hibiscus Whytei, *Stapf* (sp. nov.); affinis *H. lunariifolio*, Willd., differt bracteis epicalycis semper 10 angustis a basi sublinearibus, corolla minore 1½ poll. longitudine vix excedente.

Caulis superne pilis stellatis conspersus, demum glabrescens. *Folia intermedia* deltoideo-ovata vel ovata, basi rotundata vel subtruncata, acuta vel in acumen lineare producta, crenato-dentata dentibus alternis multo majoribus binis ad diametrum folii maximum positis magis minusve productis, 1½–3½ poll. longa lataque, utrinque pilis aut stellatis aut simplicibus parce conspersa; petioli graciles, ⅓ ad ultra 1 poll. longi, pubescentes; stipuli lanceolati, 3 lin. longi. *Folia floralia* ovato-lanceolata vel lanceolata, basi acuta vel subcuneata, quam intermedia minora, breviter petiolata, cæterum illis similia. *Pedicelli* 2–5 lin. longi, primo dense stellato-pilosi, demum subglabrati. *Bracteæ* epicalycis 10, a basi sublineares, superne sensim attenuatæ, 5–7 lin. longæ, 1–1½ lin. latæ, sparse stellato-pilosæ. *Calyx* 7–8 lin. longus, profunde 5-fidus, segmentis late oblongis acuminatis 2–3 lin. latis extus sparse stellato-pilosis intus villoso-tomentosis. *Petala* obovata, 1½ poll. longa, e siccato lutea, basi purpureo-maculata, extus molliter pubescentia. *Capsula* ovoideo-globosa, fulvo-strigoso-tomentosa, submatura 7 lin. longa.

Within 20 miles of Karkatown, *Whyte.*

Gomphia amplectens, *Stapf* (sp. nov.); affinis *G. Mannii*, Oliver, differt foliorum auriculis magnis ultra basin petioli productis post eum imbricatis et simul ramulum amplectentibus, floribus paniculatis, sepalis sub maturitate majoribus.

Folia lanceolata, basi auriculato-cordata auriculis magnis ultra basin petioli productis post eum imbricatis et simul ramulum amplectentibus, acuminata, margine supra medium minute serrulata, ad fere 1 ped. longa, ad 3 poll. lata, tenuiter coriacea, costa supra prominente utrinque linea impressa addita, nervis lateralibus utrinque circiter 16 prorsus curvatis obliquis supra prominulis, venis inconspicuis; petiolus crassus 3 lin. longus. *Inflorescentia* paniculata, semipedalis, ramis ad 2½ poll. longis subpatulis. *Flores* sub anthesi ignoti, plerumque 3-ni, fasciculati, fasciculis superioribus 3–2 lin. distantibus; pedicelli 6–7 lin. longi, 1–2 lin. supra basin disarticulati. *Sepala* oblonga, subobtusa, sub maturitate 6–7 lin. longa, ad 3 lin. lata, patentia. *Fructus* ignotus.

Within 20 miles from Karkatown.

Gomphia subcordata, *Stapf* (sp. nov.); affinis *G. congestæ*, Oliver (quoad plantam e Sierra Leone), sed foliis basi subcordatis, petiolo crassissimo, ramulis et pedunculis (ima basi excepta) stipulis aphyllis destitutis.

Folia late lanceolata vel oblongo-lanceolata, acuta, basi subcordata, margine fere a basi minute serrata, ad 6 poll. longa, ad 2½ poll. lata, coriacea, costa supra distincte infra vix prominente, nervis lateralibus utrinque circiter 10 subpatulis prorsus arcuatis supra prominulis, venis inconspicuis; petiolus crassissimus, ad 3 lin. longus. *Racemi* suberecti, ½ ped. longi pedunculo 1 poll. longo incluso, rhachi subgracili. *Flores* sub anthesi ignoti, inferne circiter 6-ni fasciculati, fasciculis inferioribus 3–6 lin. distantibus; pedicelli 5–6 lin. longi, ½–1 lin. supra basin disarticulati. *Sepala* sub maturitate ovato-oblonga, obtusa, 4–5 lin. longa, 2½–3 lin. lata, patula. *Fructus* (submaturus) fere globosus, 2 lin. diametro.

Within 20 miles of Karkatown, *Whyte*.

Olax major, *Stapf* (sp. nov.); affinis *O. Mannii*, Oliver, differt foliis minus acuminatis, floribus duplo majoribus.

Planta glaberrima. *Ramuli* virides. *Folia* elliptica vel late lanceolata, symmetrica vel asymmetrica, basi obtusa vel subacuta, magis minusve acuminata, 3½–5 poll. longa, 1½–2 poll. lata (acumine 2–6 lin. longo), subcoriacea, utrinque viridia, nervis secundariis utrinque circiter 6 obliquis tenuibus arcuato-connectis arcubus circiter 2 lin. a margine distantibus, venis tenuissimis inconspicuis; petioli 1–2 lin. longi. *Racemi* ad 4 lin. longi, interdum brevissimi, fasciculiformes, ad 7-flori, basi bracteis paucis vel numerosis squamiformibus vacuis muniti; bracteæ florales ovatæ vel lanceolatæ, ⅓ lin. longæ; pedicelli ½–¾ lin. longi. *Calyx* brevissime cupularis, truncatus. *Petala* linearia, subacuta, 4 lin. longa. *Stamina* perfecta 3, 2 alternipetala, 1 oppositipetalum: stamina antheris effœtis 5, 4 oppositipetala, 1 alternipetalum; filamenta petalis fere tota longitudine adnata, bullata (imprimis staminum imperfectorum).

Within 6 miles of Monrovia, *Whyte.*

The petals of *Olax Mannii* are under 2 lin. long.

UROBOTRYA, *Stapf* (gen. nov. Olacacearum).

Affinis *Opiliæ*, Roxb., sed toto habitu, racemis longissimis, disco annulari indiviso, filamentis quam petalis duplo longioribus distincta.

Calyx ad marginem obscurum redactus. *Petala* 4–5, valvata tandem libera et reflexa. *Stamina* petalis opposita, hypogyna, filamentis capillaribus longissimis; antheræ ovoideæ, basi affixæ. *Discus* annularis, crassus, undulatus vel truncatus. *Ovarium* 1-loculare; stigma stylo brevi imposito vel sessile, parvum; ovulum 1, e placenta ascendente ex apice loculi pendulum.

Fructus mihi ignotus; a Dryandro bacca descripta.

Frutices glabri, nisi interdum racemorum rhachides pubescentes. *Folia* subcoriacea vel membranacea. *Racemi* longi, penduli; bracteæ nullæ vel hyalinæ. *Flores* fasciculati, pedicellati.

U. angustifolia, *Stapf* (sp. nov.).

Frutex glaberrimus. *Folia* lineari-lanceolata vel oblonga, acuminata, basi acuta, 6 poll. longa, 1–2 poll. lata, subcoriacea, nervis lateralibus utrinque circiter 7–8 tenuibus uti venis inconspicuis vel exsiccando prominulis; petioli crassiusculi, ad 2½ lin. longi. *Racemi* ad 10 poll. longi, ebracteati; pedicelli graciles, ½ poll. longi. *Petala* ovato-oblonga, subacuta, 1½ lin. longa. *Filamenta* 3 lin. longa. *Stigma* sessile.

Within 6 miles of Monrovia, *Whyte*; near the St. Paul's River, 60 miles inland, *Reynolds.* Also in Sierra Leone, *Smeathman.* It is the fruit of the latter which was described by Dryander as baccate in a note in the herbarium of the British Museum.

U. latifolia, *Stapf* (sp. nov.).

Frutex racemis exceptis glaber. *Folia* late elliptica, basi rotundata, apice breviter acuminata, 5 poll. longa, 3 poll. lata, fere membranacea, nervis lateralibus utrinque 5, curvatis, tenuibus distinctis, venis inconspicuis. *Racemi* ad 8 poll. longi, bracteati; rhachis minute pubescens; bracteæ ovatæ, acutæ, ½–¾ lin. longæ, hyalinæ, viridi-flavescentes, pedicelli gracillimi,

2 lin. longi. *Petala* 1 lin. longa. ovato-oblonga, obtusa. *Stigma* sessile.

Within 6 miles of Monrovia, *Whyte*.

Professor Engler mentions, in 'Natürliche Pflanzenfamilien,' Nachtr. p. 143, under *Opilia* a species with long pendulous racemes which he calls *O. Afzelii*. It is evidently a species of *Urobotrya*; but, in the absence of a description, I am not able to identify it. Another species of the same genus was collected by Kalbreyer near Victoria, Cameroons. I add here its description:—

Urobotrya minutiflora, *Stapf* (sp. nov.).

Frutex glaberrimus, 4–6-pedalis. *Rami* virides. *Folia* oblonga vel elliptica vel ovato-oblonga, acuminata, basi rotundata, 4–6 poll. longa, 1½–2 poll. lata, firme membranacea, pallide viridia, nervis lateralibus utrinque 5–7 obliquis sub margine indistincte arcuato-connectis tenuibus, venis inconspicuis; petiolus crassiusculus, 1–1½ lin. longus. *Racemi* gracillimi, ad 8 poll. longi, ebracteati; pedicelli gracillimi, 2 lin. longi, 4–6-ni. *Petala* late oblonga, obtusiuscula, ¾ lin. longa, viridia. *Filamenta* ad 3 lin. longa. *Ovarium* in stylum brevem productus.

In shady bush, near Victoria, Cameroons, *Kalbreyer*.

Iodes reticulata, *Stapf* (sp. nov.); affinis *I. africanæ*, Welw., differt foliis breviter petiolatis, eximie reticulatis, inflorescentia fulvo-tomentosa.

Rami scandentes, fulvo-pubescentes; fibrilli extra-axillares. *Folia* ovato-elliptica vel obovato-oblonga, acute acuminata, basi rotundata vel subcordata, sæpe asymmetrica, 2½–5 poll. longa, 1¼–2¼ poll. lata, membranacea, subtus paulo pallidiora, nervis lateralibus utrinque circiter 6 curvatis obliquis uti venarum reticulatione arcta utrinque prominulis; petioli 3 lin. longi, fulvo-pilosi. *Paniculæ* sæpe dichotome subcorymbosæ, pedunculo 1–2 poll. longo suffultæ, terminales, interdum nonnullis minoribus e foliorum summorum axillis additis, fulvo-tomentosæ, bracteæ minimæ; pedicelli ½ lin. longi. *Calyx* 4-fidus, segmentis minutis. *Corolla* 4-fida, extus pubescens, ad 2½ lin. diametro, segmentis ovatis subacutis.

Sinoe Basin, *Whyte*.

Ampelocissus gracilipes, *Stapf* (sp. nov.); affinis *A. salmonea*, Planch., sed indumento tenui, pedicellis gracilibus glabrescentibus, corollis longioribus distinctus.

Planta scandens. *Ramuli* novelli cinnamomeo-floccoso- vel araneoso-tomentelli, mox glabrescentes; cirri dichotomi, longi. *Folia* late cordato-ovata vel subpentagono-cordata, acute acuminata, sinu lato, margine serrato-crenata, ad 6 poll. longa, ad 5 poll. lata, membranacea, in gemma dorso cinnamomeo-tomentosa, citissime glabrescentia indumento parco araneoso persistente, hinc inde purpurascentia, e basi 5-nervia, nervis lateralibus e costa ortis utrinque 4–5 omnibus uti venis tenuibus; petioli paulo ultra 2 poll. longi, graciles. *Paniculæ* oppositifoliæ, pedunculo ad 4½ poll. longo suffultæ, densifloræ, ad 1½ poll. longæ, 2 poll. latæ, ramo infimo in cirrum dichotomum commutato, ramis ramulisque primo cinnamomeo-araneosis cito glabratis; bracteæ ovatæ, tenuiter membranaceæ, ad 1 lin. longæ; pedicelli graciles, ad 1 lin. longi. *Calyx* patelliformis, ½ lin. diametro, glaber. *Petala* 5, oblonga, cucullata, ad 1 lin. longa, glabra. *Stamina* 5. *Ovarium* 10-sulcatum; stylus brevissimus, late conicus.

Sinoe Basin, *Whyte* (flores ☿).

Eriocœlum pendulum, *Stapf* (sp. nov.); affinis *E. racemoso*, Baker, differt floribus multo minoribus, racemis flexuoso-pendulis longissimis.

Rami juniores fusco-hirtelli, mox glabrescentes. *Folia* 2–3-juga; rhachis 1½–2 poll. longa, fulvo-hirtella, glabrescens; foliola infima ad rhachis basin quam reliqua multo minora cæterum iis simillima, intermedia et summa oblonga vel lanceolato-oblonga, interdum subobliqua, acuminata, basi subacuta vel obtusa, 2½–4 poll. longa, 1¼–1¾ poll. lata, chartacea, præter costam sparse adpresse hirtellam glabra, nervis lateralibus utrinque 8–9 prorsus curvatis uti venarum reticulatione tenui subtus prominula; petioluli 1–2 lin. longi. *Racemi* pedales, graciles, flexuoso-penduli, densiflori, ex toto fulvo-hirtelli; rhachis fere filiformis, a basi florifera; bracteæ lanceolatæ, parvæ; pedicelli ½–¾ lin. longi, fasciculati. *Sepala* ovata, subacuta, fulvo-hirtella, ½ lin. longa. *Petala* anguste lanceolata, 1 lin. longa. *Filamenta* 1½ lin. longa.

Near Monrovia, *Whyte.*

Deinbollia polypus, *Stapf* (sp. nov.); affinis *D. insigni*, Hook. f., sed foliolis angustioribus, basi magis acutatis tenuissime acuminatis, panicula exsiccando nigrescente, floribus paulo minoribus pedicellis medio articulatis, staminibus paucioribus differt.

Foliola lanceolata, tenuissime acuminata, basi acutata, ad

8 poll. longa, ad 2¾ poll. lata (acumine angusto ad ½ poll. longo), chartacea, glaberrima, exsiccata supra saturate viridia, subtus fuscescentia, nervis lateralibus utrinque 7–9 obliquis tenuibus uti venarum reticulatione utrinque (imprimis subtus) eleganter prominulis; petioluli 1 lin. longi. *Paniculæ* ad 7 poll. longæ: rhachis stricta, glabra vel parcissime papilloso-puberula papillis minutissimis; rami divaricati, ad 4 poll. longi; flores numerosi fasciculati in ramulis 1–2 lin. longis minutissime papilloso-puberulis; bracteæ lanceolatæ, minutæ; pedicelli ¾ lin. longi, medio articulati. *Calyx* 3 lin. longus, sepalis rotundato-ellipticis dorso parce papilloso-puberulis cæterum glabris. *Petala* elliptico-oblonga, basi in unguem attenuata marginibus ad constrictionem inflexa, 2 lin. longa. *Stamina* 10; filamenta pilosa, ad 1½ lin. longa; antheræ ⅓ lin. longæ.

Sinoe Basin, *Whyte.*

The name *Deinbollia polypus* was chosen in allusion to the numerous persistent pedicel-bases at the ends of the short branchlets of the panicle. The flowers of *D. insignis* are on the whole less numerous, although they appear just as crowded as in *D. polypus*, on account of their being larger and supported by stouter pedicels. The latter are, moreover, articulated close to the base.

Bersama leiostegia, *Stapf* (sp. nov.); affinis *B. paullinioides*, Baker (quoad plantam e Sierra Leone), differt foliolis firmioribus basi obtusis, stipulis multo longioribus lanceolato-acuminatis marginibus ciliolatis exceptis glaberrimis, pedicellis calycibusque parce pubescentibus.

Ramuli glabri, robusti. *Folia* 6–8-juga; rhachis magis minusve interrupte alata alis interdum angustissimis, 1 ped. longa vel ultra; foliola infima 1½–2½ poll. supra rhachis basin sita, oblonga, anguste acuminata acumine lineari 6 lin. longo, basi obtusa vel rotundata, ad 5 poll. longa, ad 2 poll. lata, firme membranacea, glabra, nervis lateralibus utrinque circa 11 tenuibus, venarum reticulatione utrinque prominula; petioluli vix 1 lin. longi; stipulæ lanceolatæ, acuminatæ, marginibus exceptis glaberrimæ, ad 14 lin. longæ. *Racemi* rigidi, fere 6 in. longi; rhachis ad 1½ poll. a basi nuda, superne parce pilosula; bracteæ subulatæ, laxe pilosæ; pedicelli tenuiter parce pubescentes, ad 3 lin. longi. *Calyx* 2 lin. longus, parce pubescens; lobi ovati, subobtusi, infimi duo fere ad apicem connati. *Petala* oblonga cum ungue 4–5 lin. longa, lamina fulvo-cinerea tomentella reflexa. *Stamina* 4; filamenta per paria basi connata, lanceolata, pubescentia. *Ovarium* 4-loculare, sericeo-tomentosum, in stylum superne glabrum contractum.

Sinoe Basin, *Whyte.*

Spiropetalum triplinerve, *Stapf* (sp. nov.); affinis *S. heterophyllo*, Gilg, differt foliis 3–4-jugis, foliolis supra subglaucis subtus cinnamomeis triplinervibus (*i. e.* nervis secundariis infimis 2 fere a basi ortis, cæteris perpaucis remotis), venis transversis subhorizontalibus utrinque eleganter prominulis.

Ramuli floriferi robusti, primo minutissime ferrugineo-tomentelli, deinde glabrescentes, cortice fuscescente. *Folia* 3–4-jugi; rhachis 2 ad fere 4 poll. longa, tenuissime pubescentia, deinde glabrescens; foliola oblonga vel elliptico-oblonga, breviter acuminata, basi subacuta vel obtusa, ad 2 poll. longa, 1 poll. lata, coriacea, supra glabra, subtus in costa tenuiter pubescentia cæterum glabra, nervis lateralibus utrinque 3 admodum obliquis tertio a secundo longe remoto, venis utrinque prominulis; petioluli 1–1½ lin. longi, tomentelli. *Racemi* densi, sæpe compacti, solitarii vel fasciculati, ¾–1½ poll. longi, a basi floriferi ubique fulvo-velutini; bracteæ ovatæ, parvæ; pedicelli brevissimi. *Calyx* 1½–1¾ lin. longus, ad medium 5-partitus, segmentis oblongo-ovatis obtusis. *Petala* lorato-linearia e basi latiore, ad 5 lin. longa. *Stamina* longiora calyce breviora. *Carpella* velutino-tomentosa cum stylis calycem æquantia.

Near Monrovia, *Whyte.*

Connarus libericus, *Stapf* (sp. nov.); affinis *C. floribundo*, Schum. & Thonn., differt imprimis inflorescentia, nempe paniculis brevibus gracilibus plerumque racemiformibus versus ramorum apices fasciculatis.

Rami floriferi robusti, cortice cinerascente lenticellato. *Folia* circiter 4-juga, glaberrima; rhachis 3–4 poll. longa, teres; foliola elliptica vel obovato-elliptica, subabrupte acuminata, basi obtusa vel subacuta, 2½–3 poll. longa, 1¼–1½ poll. lata, tenuiter coriacea, nervis lateralibus utrinque circiter 5 valde obliquis, venis transversis tenuissimis; petioluli 2 lin. longi. *Paniculæ* 1½–2 poll. longæ, sæpe racemiformes vel saltem ramis longioribus paucis, a ¾–1 poll. supra basin divisæ, tenuiter ferrugineo-pubescentes, graciles, fasciculatæ, numerosæ versus ramorum apices; bracteæ minimæ; pedicelli ad 1 lin. longi, graciles, medio articulati. *Calyx* vix 1 lin. longus, profunde 5-partitus, segmentis ovatis subobtusis tenuiter pubescentibus. *Petala* lanceolato-ligulata, 3 lin. longa, $\frac{2}{3}$ lin. lata. *Stamina* majora calycem æquantia. *Carpella* sericeo-villosula, cum stylis gracillimis $1\frac{1}{2}$–$1\frac{3}{4}$ lin. longa.

Within 6 miles of Monrovia, *Whyte.*

Connarus Reynoldsii, *Stapf* (sp. nov.); affinis *C. floribundo*, Schum. et Thonn., differt foliis conspicue nervosis, inflorescentiis axillaribus et terminalibus quam foliis brevioribus densissimis, petalis longioribus, staminibus stylisque multo brevioribus.

Frutex ramis cortice brunneo tectis multi-lenticellatis. *Folia* 3–4-juga; rhachis gracilis tenuiter rufo- vel fulvo-pubescens vel tomentella; ima juga circiter 2 poll. a basi distantia; foliola oblonga vel elliptico-oblonga, breviter acuminata acumine cuspidato, basi rotundata vel subacuta, 2–$3\frac{1}{2}$ poll. longa, $\frac{3}{4}$–$1\frac{1}{2}$ poll. lata, coriacea, supra glaberrima, nitidula, infra in costa nervisque magis minusve tenuiter fulvo-pubescentia cæterum fere glabra, nervis lateralibus utrinque 2–3 valde obliquis et prorsus curvatis, venarum reticulatione laxa prominula; petioluli tomentelli, $1\frac{1}{2}$ lin. longi. *Paniculæ* numerosæ in foliorum axillis et ad ramorum apices dense congestæ, circa 2 poll. longæ, densifloræ, fulvo-velutinæ; bracteæ ovatæ vel lanceolatæ, acutæ, pedicellos $\frac{1}{2}$–$1\frac{1}{2}$ lin. longos paullo superantes. *Calyx* fulvo-velutinus, $1\frac{1}{2}$ lin. longus, ad medium 5-lobus, lobis ovatis subacutis vel obtusiusculis. *Petala* anguste lorato-linearia, superne longe attenuata et crispo-undulata, circiter 7–8 lin. longa, ad $1\frac{1}{2}$ lin. lata. *Stamina* perfecta 10; longiorum filamenta paulo ultra $1\frac{1}{2}$ lin. longa, breviorum duplo breviora. *Carpella* 5, fulvo-tomentella, cum stylis parum brevioribus vix $\frac{3}{4}$ lin. longa, stigmata subdisciformia. *Ovula* 2, collateralia.

Liberia, near the St. Paul's River, about 70 miles from the coast, *H. Reynolds.*

Dalbergia Ecastaphyllum, *Taub.*, forma **trifoliolata**, Stapf, a typo differt foliolis 3, terminali quam lateralibus multo majore.

Foliorum rhachis 1–$1\frac{1}{4}$ poll. longa; foliola oblonga vel ovato-oblonga, basi rotundata, apice sensim breviter acuminata, terminali ultra 6 poll. longa, ad $2\frac{3}{4}$ poll. lata, lateralia minora, coriacea, supra opaca, subtus subglaucescentia, pilis minutissimis sparsis adpressis, nervis lateralibus utrinque circiter 9, cæterum ut in typo. *Flores* in specie majusculi, cæterum ut in typo.

Sinoe Basin, *Whyte.*

This is a rather striking form, which might be taken at the

first glance for a distinct species; but the structure and general aspect of the leaflets (apart from the size) and of the flowers are absolutely as in *Dalbergia Ecastaphyllum*. The only other pinnate-leaved specimens of *D. Ecastaphyllum* examined by me are from Liberia (Grand Bassa, *Vogel*; *Dinklage*, 1986) and the Cameroons (*Zenker*, 2153). In these the leaflets are exactly (also in size) like those of the typical unifoliolate leaves of *D. Ecastaphyllum*. They were, probably on account of the number of leaflets, distributed as *D. Monetaria*, which has glabrous glossy long acuminate leaflets with a more marked venation. I have seen no examples of *D. Monetaria* from Africa, Heudelot's specimens quoted under this name in 'Flora of Tropical Africa,' ii. p. 236, belonging to a distinct species, for which I propose the name *D. Heudelotii*, Stapf. I add a description of it:—

Dalbergia Heudelotii, *Stapf* (sp. nov.); affinis *D. Ecastaphyllo*, Taub., differt foliis normaliter 3–7-foliolatis, fructibus asymmetrice obovatis majoribus crassioribus sublignosis, bullatis, ferrugineo-velutinis.

Frutex ramis cinerascentibus vel fuscescentibus. *Folia* 3- vel sæpius 5- rarius 7-foliolata; rhachis ad 3½ poll. longa, tenuiter ferrugineo-pubescens, demum glabrata; foliola ovata vel elliptica, breviter obtuseque acuminata vel subobtusa, basi rotundata, terminale maximum ad 6 poll. longum, ad 3¾ poll. latum, supra glabra arcte tenuiterque reticulata, subtus pallide fuscescentia, pilis minutissimis adpressis aspersa, nervis lateralibus (in majoribus) utrinque 8–10 prorsus arcuatis tenuibus uti venis prominulis; petioluli 2–3 lin. longi. *Racemi* vel *paniculi* pauciramosi ad 1½ poll. longi, ubique rufo-villosuli; bracteæ bracteolæque minutæ, oblongæ; pedicelli ad 1½ lin. longi. *Calyx* 1½ lin. longus, breviter perlate dentatus, rufo-tomentosus. *Corolla* 5 lin. longa, petalorum unguibus demum e calyce exsertis; vexilli lamina late orbiculari-ovata, 2-loba. *Legumen* immaturum dense rufo- vel fulvo-tomentosum marginibus latis undulatis, maturum asymmetrice obovatum, ad 1⅓ poll. longum, ad 10 lin. latum, uno latere convexum, bullatum, ferrugineo-velutinum, sutura incrassata, valvis ad 2 lin. crassis lignosis; stipes tenuis fere 2 lin. longus. *Semen* unicum.

Senegambia, Rio Nunez, *Heudelot*, 623. Sierra Leone, Kahreni, *Scott Elliot*, 5626*. Without precise locality, *Afzelius*.

D. Monetaria, Linn. f., differs in having glabrous (in the

typical form), distinctly and often long acuminate leaves, and glabrous, neither undulate nor bullate fruits.

Ostryocarpus major, *Stapf* (sp. nov.); affinis *O. ripario*, Hook. f., differt foliolis 7-foliolatis, foliolorum venis utrinque plane inconspicuis, paniculæ ramis longioribus, floribus paulo majoribus.

Folia 7-foliolata; rhachis gracilis, basi incrassata, circiter 4 poll. longa, glabra; foliola infima $\frac{3}{4}$ poll. supra basin, terminale ellipticum, breviter acuminatum, basi subobtusum, $3\frac{1}{2}$ poll. longum, 2 poll. latum, coriaceum, glaberrimum, nervis lateralibus utrinque 5–6 obliquis pertenuibus, venis plane inconspicuis; petiolulus $3\frac{1}{2}$ lin. longus. *Paniculæ* pedales, breviter pedunculatæ, ubique dense tenuissime ferrugineo-pubescentes; rhachis subrobusta, curva; rami racemos densos exhibentes ad 2 poll. longi, patuli; bracteæ ad ramorum bases mox deciduæ, ad pedicellos vix ullæ; bracteolæ ad calycum bases 2, minutæ; pedicelli inferiores sæpe geminati, graciles, $1–1\frac{1}{2}$ lin. longi. *Calyx* obovoideus, $2–2\frac{1}{2}$ lin. longus, eodem indumento induto ac rhachis et ramis paniculæ, dentibus latissime brevissime triangularibus. *Corolla* $5–5\frac{1}{2}$ lin. longa, exsiccando nigrescens; vexillum orbiculare, emarginatum, brevissime unguiculatum; alæ et carina vexillo æquilongæ, unguibus 2 lin. longis. *Staminum* tubus $3\frac{1}{2}$ lin. longus. *Ovarium* dense minute pubescens; ovula 8.

Within 6 miles of Monrovia, *Whyte*.

Macrolobium obliquum, *Stapf* (sp. nov.); affinis *M. diphyllo*, Harms, differt foliis 7-jugis, floribus majoribus, longius pedicellatis.

Folia 7-juga; rhachis ad 10 poll. longa, basi incrassata, atro-ferrugineo-hirtella, demum glabrescens; foliola ima $\frac{1}{3}$ poll. supra rhachidis basin, vix $2\frac{1}{2}$ poll. longa, intermedia et summa ad 6 poll. longa, ad $1\frac{2}{3}$ poll. lata, omnia oblique lanceolata vel lanceolato-oblonga, oblique tenuiter acuminata, basi obtusa, dimidio extus spectante quam altero fere duplo latiore, glabra, nervis lateralibus utrinque 13–15, $1–1\frac{1}{2}$ lin. sub margine nervo collectivo eleganter connectis subtus prominentibus, venarum reticulatione utrinque tenui prominula; petioluli 1 lin. longi. *Panicula* ultra $\frac{1}{2}$-pedalis ramis paucis divaricatis ad 3 poll. longis ubique tenuiter ferrugineo-hirtella; bracteæ obovatæ, naviculares, 5 lin. longæ, mox deciduæ; bracteolæ 2 flores involucrantes obovatæ, fere 6 lin. longæ, obtusiusculæ; pedicelli ad 6 lin. longi. *Calyx* fere ad basin 5-fidus, segmentis lineari-lanceolatis ciliolatis 2½–2¾ lin. longis. *Vexillum* longiuscule unguiculatum, lamina rotundatum profunde 2-lobum, petala cætera calycis segmentis simillima eisque æquilonga. *Stamina fertilia* 3; filamenta pilosa; antheræ 2½ lin. longæ; staminodia pauca, minutissima, dentiformia. *Ovarium* rufo-villosum; ovula circiter 5.

Sinoe Basin, *Whyte.*

Acioa Whytei, *Stapf* (sp. nov.); affinis *A. pallescenti,* Baill., differt foliis minoribus, inflorescentiis glabris rhachi parce pilosula excepta.

Ramuli glabri, cortice brunneo. *Folia* oblongo-elliptica vel ovato-lanceolata, subacuminata, basi rotundata, 2¼–4 poll. longa, 1–1⅔ poll. lata, coriacea, pallide viridia, nervis lateralibus utrinque 6–7 uti venarum reticulatione laxa utrinque prominulis; petiolus crassus, 1 lin. longus. *Racemi* rhachi parce pilosula excepta glabri, vix pollicares, a basi densiflori; bracteæ ovato-lanceolatæ, ad 2 lin. longæ, bracteolæque pallidæ, tenuiter membranaceæ, glabræ; pedicelli graciles, glabri, 3–4 lin. longi. *Receptaculum* tenue, glaberrimum, 8–9 lin. longum. *Calyx* 4–5 lin. longus; sepala elliptica, obtusissima, extus præter margines in alabastro imbricatos glaberrima, intus albo-velutina. *Petala* elliptico-oblonga, breviter unguiculata, 2-loba, 4½ lin. longa. *Filamenta* in laminam liguliformem 1¼ poll. longam ½ lin. latam juncta, parte summa libera 3–4 lin. longa excepta.

Within 6 miles of Monrovia, *Whyte.*

A specimen collected by G. F. Scott Elliot (no. 5521) near Kafogo, Sierra Leone, after flowering but with some remnants of inflorescences, seems to be identical with *A. Whytei.*

Cassipourea cæsia, *Stapf* (sp. nov.); affinis *C. parvifoliæ,* Stapf (=*Dactylopetalum parvifolium,* Scott Elliot), differt foliis supra cæsiis, calyce cæsio, petalis dense lanatis, disco intrastaminali multo minus alto lobulato lobulis cum filamentis alternantibus.

Frutex ramulis gracilibus primo adpresse pubescentibus cito glabratis, cortice brunneo. *Folia* anguste elliptica vel obovata, latiuscule acuminata, basi cuneata vel acuminato-cuneata, 2–4½ poll. longa, 1⅓–2 poll. lata, subchartacea, glabra, supra eximie cæsia subtus viridia, nervis lateralibus utrinque circiter 6, 1–

2 lin. sub margine arcuato-connectis tenuibus uti venarum reticulatione tenuissima utrinque vix prominulis; petioli 2–2½ lin. longi, subadpresse hirtelli. *Stipulæ* lanceolatæ, fulvo strigilloso-hirtellæ, ad 2 lin. longæ. *Flores* 1–4 in axillis foliorum congesti; bracteæ minutæ, ovatæ, hirtellæ; pedicelli ½ lin. longi, glabri. *Calyx* semiglobosus, 2 lin. longus, extus glaber, cæsius, intus pallide virescens et sericeo-velutinus, ad medium 5-fidus, segmentis ovatis subacutis. *Petala* anguste lanceolata, ad 2½ lin. longa, fimbriata fimbriis ad 2 lin. longis dense albo-lanatis. *Stamina* 15, epipetala 5 ad 2½ lin. longa, ima basi disco intrastaminali brevissimo intus piloso lobulato, lobulis cum filamentis alternantibus adnata. *Ovarium* tomentosum, 3-loculare.

Within 20 miles of Karkatown, *Whyte*.

Eugenia Whytei, *Sprague* (sp. nov.); affinis *E. calophylloidi*, DC., differt ramulis glabris, foliis minus coriaceis, subtus glandulis prominentibus punctatis, receptaculo glabro styloque minore.

Ramuli glabri, cortice cinereo vel subfusco. *Folia* elliptico-ovata vel oblongo-ovata, apice obtuse acuminata, basi in petiolum attenuata, 2½–4½ poll. longa, 1–1¾ poll. lata, tenuiter coriacea, glabra, supra olivacea vix nitidula, subtus pallidiora opaca, nervis lateralibus primariis utrinque 7–9 subtus prominulis, secundariis iis parallelis hinc inde interjectis, tertiariis supra inconspicuis subtus subtiliter reticulatis; glandulæ utrinque præcipue subtus prominentes; petiolus 2–3 lin. longus, supra sulcatus. *Flores* plures in axillis fasciculati; pedicelli 1–3 lin. longi, glabri, nigrescentes; bracteolæ deltoideæ ciliatæ. *Receptaculum* glabrum. *Sepala* orbiculari-ovata, obtusissima, ciliolata, exteriora ½ lin., interiora ¾ lin. longa. *Petala* breviter obovata, 2 lin. longa, ciliolata. *Stamina* iis *E. callophylloidis* similia. *Ovarium* biloculare; stylus 2 lin. longus, stigmate peltato.

Sinoe Basin, ♂, *Whyte*; within a radius of 6 miles from Monrovia, ☿, *Whyte*.

Osbeckia liberica, *Stapf* (sp. nov.); affinis *O. senegambiensis*, Guill. & Perr., differt bracteis haud scariosis, citissime deciduis, sepalis subulatis, connectivo basi distincte elongato.

Herbæ annua (?). *Caulis* gracilis, subquadrangularis, minute adpresse strigillosus, pilis plerumque nigrescentibus. *Folia* lanceolata, rarius ovato-lanceolata, apice longe attenuata, subacuminata, basi rotundata vel subacuta, 2–2½ poll. longa, ⅔–¾ poll. lata, membranacea, utrinque adpresse strigillosa (infra tenuius), 3–5pli-nervia; petioli graciles, 3 lin. longi. *Paniculæ* pauciflore, ramis demum ad 1½ poll. longis gracilibus, eodem indumento indutis ac cauli nisi densiore, internodiis intermediis sub maturitate 2–3 lin. longis; bracteæ tenuiter membranaceæ, lanceolatæ, 2½ lin. longæ, mox deciduæ; pedicelli ½ lin. longi. *Receptaculum* ovoideo-globosum, sub anthesi 2½ lin. longum, deinde paulo elongatum, ad medium strigillosum supra medium squamulis apice stellato-setosis additis. *Sepala* subulata, 2 lin. longa, patule setosa, mox decidua. *Petala* rosea, late oblique obovata, 4 lin. longa. *Stamina* subæqualia; filamenta 2 lin. longa, antheræ connectivo basi producto antice appendiculo parvo 2-lobo instructo, connectivi continuatione et appendice in 5 alternis longioribus. *Ovarium* apice pilosum.

Within 6 miles of Monrovia, *Whyte*; Sinoe Basin, *Whyte*.

Dissotis paucistellata, *Stapf* (sp. nov.); affinis *D. petiolatæ*, Hook. f., differt indumento rudiore copiosiore, florum capitulis majoribus, receptaculo stellato-setoso.

Caulis glanduloso-hirsutus pilis patulis apice glanduligeris. *Folia* ovata, subacuminata, basi rotundata vel subcordata, 1½–2 poll. longa, 1–1¼ poll. lata, 5-nervia, utrinque strigilloso-hirsuta; petioli ad ½ poll. longi, dense hispidi. *Flores* in capitulos circiter 10-floros diametro 1 poll. foliis suffultos bracteatos collecti. *Bracteæ* tenuiter membranaceæ, exteriores late ovatæ ad 4 lin. longæ, interiores angustiores, ciliatæ et in dorso sparse pilosæ. *Receptaculum* e basi angustata oblongum, anthesi peracta ovoideo-oblongum, supra medium constrictum, ad 7 lin. longum ima basi setis tenuibus simplicibus glanduligeris supra usque ad medium setis stellatis sparsis instructum. *Sepala* lanceolata, acuta, 3 lin. longa, parce glanduloso-setosa, persistentia. *Petala* rosea, late cuneato-obovata, ad 10 lin. longa. *Stamina* 5 filamentis 4 lin. longis et connectivo 3 lin. ultra antherarum bases producto antice ima basi 2-lobato postice ecalcarato, alia 5 filamentis 4 lin. longis connectivo brevissime producto antice 2-lobato postice minute calcarato. *Ovarium* apice setosum.

Within 6 miles of Monrovia and in the basin of Sinoe, *Whyte*.

Memecylon Simii, *Stapf* (sp. nov.); affinis *M. polyanthemo*, Hook. f., differt floribus multo majoribus in cymis densioribus.

Rami cortice fuscescente. *Folia* oblongo-elliptica, abrupte in acumen obtusum vel subacutum ad 6 lin. longum latiusculum contracta, basi breviter acutata, $2\frac{1}{2}$–$5\frac{1}{2}$ poll. longa, $1\frac{1}{4}$–$2\frac{1}{4}$ poll. lata, coriacea, opaca, subtus pallidiora, nervis venisque plane obscuris, costa subtus prominente obtusa, supra tenuiter canaliculata; petioli vix 1 lin. longi. *Cymæ* axillares, ad $\frac{3}{4}$ poll. longæ, a basi fere divisæ, densæ; bracteæ ovatæ, ad 1 lin. longæ, citissime deciduæ; pedicelli $\frac{1}{2}$–$1\frac{1}{2}$ lin. longi. *Receptaculum* obovoideo-globosum, $1\frac{1}{4}$ lin. longum. *Sepala* latissime ovata, $\frac{1}{2}$–$\frac{2}{3}$ lin. longa, ad $1\frac{1}{4}$ lin. lata. *Petala* elliptico-oblonga, crassa, vix $1\frac{1}{2}$ lin. longa, obtusa.

Sinoe Basin, *Whyte.*

Homalium molle, *Stapf* (sp. nov.); affinis *H. stipulaceo,* Welw., differt foliis subtus molliter pubescentibus, petalis in fructu maturo multo brevioribus.

Rami juniores molliter pubescentes, demum magis minusve glabrescentes, cortice brunneo vel fusco. *Folia* lanceolata vel oblonga vel elliptica, acuminata, basi rotundata, subacuta, margine repando-serrata, 4–$6\frac{1}{2}$ poll. longa, $1\frac{1}{3}$–$3\frac{1}{4}$ poll. lata, subcoriacea, supra præter costam primo minutissime puberulam glabra, subtus molliter pubescentia pube persistente, nervis lateralibus utrinque circiter 9 magis minusve prorsus curvatis venis transversis laxiusculis uti reticulatione subtus subprominula; petioli 2–3 lin. longi, tomentelli; stipulæ admodum variæ mox deciduæ vel subpersistentes, lanceolatæ usque orbiculari-auriculatæ sæpissime obliquæ, ad 6 lin. longæ, majores foliaceæ. *Paniculæ* floribundæ terminales et e foliorum superiorum axillis, ad 10 poll. longæ, ubique tenuiter molliter cinereo-pubescentes, ramis gracilibus sæpe subpendulis ad 6 poll. longis; florum fasciculi approximati vel inferiores magis distantes; bracteæ minimæ; pedicelli brevissimi. *Receptaculum* turbinatum, molliter pubescens, $\frac{1}{2}$ lin. longum. *Sepala* triangulari-ovata vel ovato-lanceolata, acuta, receptaculo paulo breviora. *Petala* sub anthesi oblonga, $\frac{1}{2}$ lin. paulo excedentia, in fructu maturo indurata obovato-oblonga, 1 lin. longa, albo-pubescentia. *Stylus* apice brevissime 3–4-fidus. —*H. stipulaceum,* Mast. in Oliver, Fl. Trop. Afr. ii. p. 498 (in part).

Sinoe Basin, *Whyte.* Also in Sierra Leone, by the Bagroo River, *Mann,* 881.

Mann's specimen was referred by Masters, l. c. to *H. stipulaceum,* Welw. (no. 2495). This has, however, glabrous leaves, petals which in the fruit are over 3 lin. long and thin, and much more deeply divided styles.

ANDROSIPHONIA, *Stapf* (gen. nov. Passifloracearum).

Affinis *Paropsiæ*, Noronha, differt inflorescentia terminali paniculata foliata, filamentis pubescentibus inferne dilatatis et in tubum ovarium cingentem connatis.

Flores hermaphroditi. *Calycis* tubus (receptaculum) turbinatus, brevis; sepala 5, oblonga, acuta, tenuissime velutina. *Petala* sepalis æquilonga et simillima nisi angustiora et paulo tenuiora. *Corona* fere ad basin multipartita, segmentis late linearibus copiose tenuiterque fimbriato-laceratis. *Stamina* 5; filamenta inferne dilatata et in tubum ovarium cingentem e gynophoro summo ortum connata, pubescentia. *Ovarium* breviter stipitatum, ellipsoideum; styli 3, liberi, antheras attingentes; stigmata globosa; ovula 2 in unaquaque placenta, collateralia. *Capsula* (immatura) subglobosa, tenuissime velutina. *Semina* ignota.—*Frutex* sempervirens. *Folia* alterna, obscure serrulata, basi biglandulosa. *Stipulæ* nullæ. *Flores* griseo-virescentes, in cymulas paucifloras sessiles vel subsessiles arcte contractas racemose dispositis, racemis ad ramorum apices in paniculas foliaceas collectis; folia floralia flores æquantes vel (inferiora) longiora, basi glandulis 2 magnis nigrescentibus notata.

A. adenostegia, *Stapf* (spec. unica).

Rami glabri, cortice brunneo tecti. *Folia* oblonga, sensim in longiusculum acumen attenuata, basi breviter constricta vel subacuminata, margine obscure remote serrulata, ad 6 poll. longa, 2 (vel ultra) pollices lata, chartacea, glaberrima, ima basi utrinque glandula nigrescente notata, nervis lateralibus utrinque circiter 8 obliquis sub margine arcuato connectis uti venarum reticulatione eleganter prominulis. *Panicula* rigida, circiter 4 poll. longa; rami (racemi) stricti, 1–2½ poll. longi, tenuissime fulvo-velutini, rhachi gracili; folia floralia subcoriacea, ovata vel elliptica, acute acuminata vel mucronata, cum petiolo distincto ⅓–1 poll. longa glandulis 1 lin. diametro. *Cymulæ* sessiles vel subsessiles arcte contractæ, pauci- vel unifloræ; bractæ minutæ; pedicelli basi disarticulati, 1½–2½ lin. longi, demum elongati et nutantes. *Calyx* 4–6 lin. longus, post anthesin magis minusve auctus; receptaculum 1½ lin. altum; sepala sub anthesi basi vix 1 lin. lata. *Petala* linearia, ½ lin. lata, grisea. *Corona* paulo ultra 1 lin. alta. *Staminum* tubus ovoideus, vix $1\frac{1}{2}$ lin. altus; filamentorum pars libera $2\frac{1}{2}$ lin. longa uti tubus extus pubescens; antheræ oblongæ, $\frac{3}{4}$–$\frac{5}{8}$ lin. longæ, medio dorso affixæ. *Ovarium* $\frac{3}{8}$ lin. longum; styli pertenues 3 lin. longi. *Fructus* (immaturus) in pedicello recurvo pendulus, subglobosus, 3 lin. longus.

Within 6 miles of Monrovia, *Whyte*.

Soyauxia grandifolia, *Gilg et Stapf* (sp. nov.); affinis *S. gabonensi*, Oliver, et *S. glabrescenti*, Engl., differt foliis lineari-oblongis amplis et spicis densis, a *S. glabrescente* etiam sepalis fulvo-sericeis.

Ramuli juniores tenuissime fulvo-tomentelli. *Folia* lineari-oblonga, acuminata acumine acuto longiusculo, basi obtusa vel subacuta, fere pedalia, $1\frac{1}{2}$–3 poll. longa, coriacea, utrinque glabra, viridia, costa validiuscula, nervis lateralibus utrinque 13–15 obliquis sub margine ipso arcuato-connectis subtus prominentibus; venis transversis et reticulatione elegante utrinque prominulis; petioli crassi, 2–$2\frac{1}{2}$ lin. longi. *Spicæ* densissimæ, a basi floriferæ, $2\frac{1}{2}$–5 poll. longæ, cylindricæ, undique fulvo-velutinæ; bracteæ ovato-lanceolatæ acuminatæ, ad 1 lin. longæ. *Sepala* ovata, $1\frac{1}{2}$ lin. longa, extus velutina, intus glabra. *Petala* late elliptica vel obovato-rotundata, ad $1\frac{1}{2}$ lin. longa. *Filamenta* ad 3 lin. longa. *Styli* 3 ad lin. 3 longi. *Ovula* 2 in unaquaque placenta. *Capsula* pedicello valde incrassato semigloboso insidens, basi calyce persistente cincta, valvis 3 late obovatis duris 1 poll. longis fere 1 poll. latis dehiscens.

Sinoe Basin, *Whyte*; Grand Bassa, *Dinklage*, 2051.

Modecca tenuispira, *Stapf* (sp. nov.); affinis *M. Mannii*, Mast., differt foliis minoribus subtus magis conspicue recticulatis, cymis breviter pedunculatis, floribus triplo majoribus, calyce minus profunde diviso.

Planta scandens, glaberrima. *Folia* oblonga vel elliptico-oblonga, breviter subacuminata, basi subacuta, $2\frac{1}{2}$–3 poll. longa, 1–$1\frac{1}{2}$ poll. lata, subchartacea, nervis lateralibus utrinque 4 uti venarum reticulatione subtus prominula; petioli 4–6 lin. longi, apice 2-glandulosi. *Cymæ* axillares, 2–4-floræ; pedunculi $1\frac{1}{2}$–3 lin. longi; pedicelli 1–2 lin. longi. *Flores* ♂: *Receptaculum* depresso-globosum, vix $1\frac{1}{2}$ lin. altum. *Calyx* tubulosus, 5-lobus, tubo (receptaculo) excluso ad 6 lin. longus, lobis oblongis obtusis

$2\frac{1}{2}$ lin. longis, marginibus hyalinis integris undulatis. *Petala* lineari-lanceolata, basi longe attenuata, fimbriata, 5 lin. longa. *Corona* tenuiter membranacea, annuliformis, tenuissime laciniata laciniis pilosulis. *Glandulæ* 5, breves, clavato-filiformes. *Filamenta* 3 lin. longa; antheræ 3 lin. longæ. *Flores* ♀ ignoti. *Semina* compressa, oblique ovata, 5 lin. longa, 3 lin. lata, secundum margines obscure tuberculata.

Sinoe Basin, *Whyte.*

Begonia Whytei, *Stapf* (sp. nov.); habitu *B. Scutulo*, Hook. f., simillima, differt floribus minoribus, petalis flavis, filamentis basi in columnam connatis, capsulis multo magis basin versus attenuatis 4-alatis.

Caulis brevis, repens, radicans, hirsuto-villosus, cataphyllis ovatis tenuibus fimbriatis 2 lin. longis. *Folia* peltata, oblique ovata, acuminata, ad 5 poll. longa, ad 3 poll. alta, margine obscure repando-serrata, membranacea, supra parcissime infra et in marginibus copiosius setulosa (imprimis in nervis), circiter 7-nervia, nervis secundariis venisque tenuibus; petioli ad 5 poll. longi, magis minusve hirsuti. *Inflorescentiæ* terminales, cymis 3–4-floris longe pedunculatis racemose dispositis, magis minusve hirsutæ; rhachis communis ad 1 poll. longa; bracteæ ad pedunculorum bases cataphyllis simillimæ, bracteæ cymas subtendentes ovatæ vel oblongæ fimbriatæ, quam inferiores multo minores; pedunculi graciles ad 3 poll. longi; pedicelli florum ♂ 4–5 lin. longi, florum ♀ vix ulli. *Flores* ♂ ante ♀ aperti, mox decidui, plerumque 3 in unaquaque cyma: *sepala* 2, rotundata, flava, 4 lin. diametro. *Filamenta* basi in columnam distinctam brevem connata, parte libera antheræ æquilonga, $\frac{1}{2}$ lin. longa. *Flos* ♀ unicus in unaquaque cyma: *sepala* ut in ♂. *Styli* 4 simplices, basi connati. *Stigmata* 4, semilunaria, haud torta. *Fructus* obpyramidalis, basi longe attenuatus, ad 9 lin. longus, 4-alatus, alis apice obtusis ad $2\frac{1}{2}$ lin. latis. *Placentæ* integræ. *Semina* ellipsoideo-globosa, laxe reticulata.

Sinoe Basin, *Whyte.*

B. Scutulum, Hook. f., is described as having bipartite placentas. There is no female flower with the specimen which we have at Kew, and only one fruit, which I do not wish to sacrifice. I am therefore not able to decide whether the affinity of *B. Whytei* and *B. Scutulum* is really as great as their general similarity would suggest.

Begonia Simii, *Stapf* (sp. nov.); affinis *B. auriculatæ*, Hook. f., differt caulo crassiore succulento purpureo, foliorum auriculo tota longitudine libero (haud petiolo adnato) nervis basalibus e sinu intimo ortis, stipulis ellipticis deciduis.

Caulis carnosus, purpureus uti tota planta glaberrimus. *Folia* oblique ovata, acuminata, basi inæqualiter auriculato-cordata, auriculo exteriore 3–5 lin. longo rotundato a basi libero, margine obscure dentato, dentibus in setulam minutam abientibus, ad 4 poll. longa, ad 2 poll. lata, carnosula, nervis præter costam circiter 5 ex ima basi ortis, nervis secundariis e costa utrinque 2–3; petioli 4–7 lin. longi, carnosuli; stipulæ deciduæ, ovato- vel oblongo-ellipticæ, parce ciliato-dentatæ, tenues, 2½ lin. longæ. *Cymæ* axillares, paucifloræ, 1 poll. breviores, pedunculo gracili suffultæ, bracteatæ, bracteis similibus nisi latiores. *Flores* ♂ pedicello gracili 2–2½ lin. longo suffulti: *sepala* 2, orbicularia basi obscure cordata, 3 lin. diametro, purpurea. *Filamenta* libera, ⅙–⅝ lin. longa; antheræ oblongæ, circiter ½ lin. longæ. *Flos* ♀ brevissime pedicellatus: *sepala* ignota. *Styli* tres, basi connati; stigmata hippocrepiformia, longiuscule papillosa. *Capsula* in pedunculo nutans, trigona, trialata, 9 lin. longa, alis demptis 3 lin. diametro, alis rotundatis maxima 3 lin. lata.

Sinoe Basin, *Whyte*.

Mussaenda conopharyngiifolia *Stapf* (sp. nov.); affinis *M. tenuifloræ*, Benth., differt indumento inflorescentiarum patule hirsuto, foliis supra præter costam setulosam glaberrimis etiamque infra costa nervisque exceptis setulosis glaberrimis, sepalis linearibus acuminatis, corollis anguste infundibuliformibus tubo latiore limbo majore.

Ramuli hirsuti mox glabrescentes. *Folia* late elliptica, breviter acuminata, basi obtusa, ultra 6 poll. longa, ad 3½ poll. lata, præter costam (utrinque) et nervos laterales subtus parce setulosos glaberrima, nervis lateralibus 7–8, venis transversis laxis; petioli 2 lin. longi, setulosi; stipulæ profunde bifidæ, ad ½ poll. longæ, segmentis lineari-subulatis setulosis. *Cymæ* corymbose dispositæ, ubique setuloso-hirsutæ; pedunculus brevis; bracteæ lineares, superne attenuatæ, fere ½ poll. longæ, setulosæ; pedicelli brevissimi. *Receptaculum* hispidulum setulis nonnullis longioribus additis. *Sepala* linearia, superne attenuata, acuta, 4–6 lin. longa, ⅔ lin. lata, setoso-ciliata, pauca uniuscuiusque inflorescentiæ foliacea lutea, late elliptica, acuminata, petiolata, ultra 3 poll. longa, 2 poll. lata, hispidula. *Corollæ* aurantiacæ tubus 10–11 lin. longus, infundibuliformi-tubulosus, superne dilatatus, ad 1¼ lin. latus, patule flavo-setulosus; lobi latissime ovati, apiculati, 3 lin. longi, ore aureo-tomentosi.

Sinoe Basin, *Whyte.*

Mussaenda macrosepala, *Stapf* (sp. nov.); affinis *M. tristigmaticæ*, Cummins, differt sepalis et corollis multo majoribus.

Ramuli subgraciles patule hirsuti. *Folia* elliptica vel elliptico-oblonga vel sublanceolata, breviter acute acuminata, basi obtusa vel acuta, ad 4 poll. longa, 2 poll. lata, supra adpresse setulosa, subtus in costa setulosa in nervis minute adpresse pilosa, margine hirsutiuscula, nervis lateralibus utrinque circiter 17, prorsus curvatis, nervis transversis tenuibus; petiolus dense hirsutus, 2½ lin. longus; stipulæ bipartitæ segmentis subulatis, appresse hirsutæ, 4–6 lin longæ. *Cymæ* densifloræ, ad ramulorum apices 2–3, dense undique flavo-hirsutæ; pedunculi ½ ad ultra 1 poll. longi; bracteæ lineari-lanceolatæ, acuminatæ, ad 4 lin. longæ; pedicelli brevissimi. *Receptaculum* densissime flavo-hispidum, vix 3 lin. longum. *Sepala* lanceolata, acute acuminata, 10–13 lin. longa, 3 lin. lata, utrinque hirsuto-tomentosa. *Corollæ* aurantiacæ tubus subcylindricus, supra medium ampliatus, ultra 1 poll. longus, dense aureo-tomentosus; limbus lobis ovatis apiculatis extus sericeo-tomentosis, 1 poll. diametro, ore aureo-velutino.

Sinoe Basin, *Whyte.*

Sabicea discolor, *Stapf* (sp. nov.); affinis *S. venosæ*, Benth., differt foliis subtus albidis dense araneoso-tomentosis, calycis segmentis quam receptaculo, præcipue in fructu, brevioribus.

Ramuli fusco-cinerei adpresse hirsuti. *Folia* ovata vel elliptica, acuminata, basi rotundata, ad 4 poll. longa, ad 1¾ poll. lata, chartacea, supra sparse hirsuta, subtus albida, araneoso-tomentosa et in nervis adpresse hirsuta, nervis lateralibus utrinque 12–15, sub margine prorsus curvatis venis transversis obscuris; petioli ad 7 lin. longi, adpresse hirsuti; stipulæ late ovatæ, acuminatæ, 3 lin. longæ, utrinque minus magisve adpresse hirsutæ. *Cymæ* multifloræ, axillares, laxæ, 1–1¼ poll. diametro, pedunculo 4–6 lin. longo suffultæ, undique albo-hirsutæ; bracteæ oblongæ, ad 1½ lin. longæ; pedicelli brevissimi vel ad 3 lin. longi. *Receptaculum* dense albo-strigillosum, ¾ lin. longum. *Calycis* segmenta

¾ lin. longa, in fructu haud aucta, ovata, obtusiuscula. *Corolla* angustissime infundibuliformis, 5 lin. longa, extus sparse adpresse pilosa; lobi ovati, acuti, 1 lin. longi. *Fructus* globosus, 1½ lin. diametro.

Near Monrovia and in the Sinoe Basin, *Whyte.* Also in the Gold Coast near Akwapim, at 1400 feet, *Murphy* (herb. *Johnson*, 679).

This might be treated as a variety, like the following species.

Sabicea lasiocalyx, *Stapf* (sp. nov.); affinis *S. ferrugineæ*, Benth., differt ramulis pedunculisque patule hirsutis, receptaculo et calycis tubo æque adpresse albo-tomentosis et præterea uti calycis segmentis longe hirsutis, capitulo compacto.

Ramuli adpresse hirsuta pilis longis patulis additis, ferruginei. *Folia* late oblonga vel elliptica, subacuminata, basi rotundata, 6–8 poll. longa, 2½–4 poll. lata, supra costa hirsutiuscula excepta glabrata exsiccando nigrescentia, subtus cinnamomea adpresse lanato-tomentosa pilis tenuibus longioribus nonnullis additis, nervis lateralibus utrinque circiter 20, marginem versus prorsus curvatis venis transversis obscuris; petioli ¾–1 poll. longi, dense hirsuti; stipulæ foliaceæ late ovatæ, acuminatæ, ad ¾ poll. longæ, dorso hirsutæ. *Capitula* densa, pedunculo 1½–4 poll. longo eodem indumento ac ramulis induto; bracteæ involucrantes rotundato-ovatæ, longe tenuiter acuminatæ, ⅔–1 poll. longæ, dorso tomentosæ et simul patule hirsutæ. *Flores* arcte congesti, sessiles. *Receptaculum* uti calycis tubus æque adpresse albo-tomentosum præterea pilis longioribus hirsutum. *Calycis* tubus brevis, demum paulo elongatus; segmenta subulata ad ½ poll. longa, albo-tomentosa insuper pilis tenuibus patulis ad 1½ lin. longis additis. *Corolla* anguste infundibuliformi-tubulosa, circiter ½ poll. longa, basi glabra, medio albo-pubescens, superne et in loborum dorsis dense albo-tomentosa; lobi vix 1 lin. longi.

Within 6 miles of Monrovia; Sinoe Basin, *Whyte.*

This might perhaps be treated as a variety of *S. ferruginea* with an exceptionally copious indumentum and sessile flowers.

Webera gracilis, *Stapf* (sp. nov.); affinis *W. congensis*, Stapf (*Tarenna congensis*, Hiern), sed foliis tenuioribus, longius acuminatis, nervis lateralibus 7–8 in utroque latere, inflorescentiis puberulis strictioribus, ramis longioribus, floribus multo minoribus, alabastris adultis 6–7 lin. longis.

Ramuli graciles, glabri, cortice pallide fusci. *Folia* elliptico-oblonga vel elliptico-lanceolata, acuminata (acumine ad ½ poll. longo), basi obtusa vel breviter acuminata, 2½–4 poll. longa, 1½–1¾ poll. lata, membranacea, glaberrima, nervis lateralibus utrinque circiter 8 valde obliquis sub margine prorsus curvatis uti venis tenuibus; petioli 1–2 lin. longi; stipulæ latissimæ, rotundatæ, apiculatæ, 1 lin. altæ. *Inflorescentiæ* corymbiformes plures ad ramulorum apices; pedunculi graciles, ad 1 poll. longi, uti rami pedicellique tenuissime pubescentes; rami primarii circiter ½ poll. longi; bracteæ ovatæ vel lanceolatæ, minutæ, pubescentes; pedicelli 2–4 lin. longi, minute bracteolati. *Receptaculum* obovoideo-globosum, ½ lin. longum, uti calyx tenuissime pubescens. *Calycis* tubus brevis lobis late triangulari-ovatis acutis. *Corollæ* glabræ tubus subcylindricus, supra medium ampliatus, ad 5 lin. longus; lobi oblongi, obtusi, 3 lin. longi. *Antheræ* 3 lin. longæ. *Stylus* glaber. *Fructus* globosus, 1¼ lin. diametro.

Sinoe Basin, and without precise locality, *Whyte.*

Oxyanthus tenuis, *Stapf* (sp. nov.); affinis *O. pallido*, Hiern, differt ramis gracilioribus, foliis tenuioribus, petiolis gracilioribus, stipulis 2–3 lin. longis, corollæ tubo tenuiore, lobis brevioribus.

Planta glaberrima. *Rami* graciles, teretes. *Folia* oblongo-lanceolata, acuminata, basi acuta, 4–6 poll. longa, 1¼–2 poll. lata, membranacea, tenuia, nervis lateralibus utrinque circiter 6, uti venis tenuibus; petiolus 3 lin. longus, gracilis; stipulæ e basi triangulari subulatæ, 2–3 lin. longæ, membranaceæ. *Cymæ* 3–4-floræ, subsessiles vel pedunculo crassiusculo ad 2 lin. longo suffultæ; bracteæ lanceolatæ, tenuiter acuminatæ, ad 2 lin. longæ. *Pedicelli* brevissimi vel ad 4 lin. longi. *Receptaculum* ovoideo-oblongum, 1 lin. longum. *Calycis* tubus brevis; segmenta subulata, 1 lin. longa. *Corollæ* tubus tenuis, cylindricus, ultra 5 poll. longus; lobi lineares, angusti, 9 lin. longi. *Antheræ* vix 2 lin. longæ.

Sinoe Basin, *Whyte.* Also in Sierra Leone, Limba Country, Madina, *Scott Elliot*, 5571.

Ixora congesta, *Stapf* (sp. nov.); affinis *I. laxifloræ*, Smith, differt foliis majoribus, floribus sessilibus ad apices ramulorum brevium corymbi trichotomi aggregatis.

Planta glaberrima præter inflorescentiam interdum sparse papilloso-puberulam. *Ramuli* teretes, fuscescentes. *Folia* lanceolato-oblonga vel elliptica, in eodem ramulo valde varia, acute acuminata acumine ad 1 poll. longo, basi longe cuneato-attenuata vel summa rotundata vel subcordata, ad 1 ped. longa, 1⅔–4 poll. lata, coriacea, nervis lateralibus utrinque 15–18 subpatulis sub margine prorsus arcuatis uti venarum reticulatione laxa utrinque prominulis; petioli ad 1 poll. longi vel summi brevissimi, crassi; stipulæ basi in tubum brevem connatæ, late ovatæ, subulato-acuminatæ, ad ½ poll. longæ. *Corymbi* multiflori, densissimi, pedunculo 3–5 poll. longo suffulti; rami primarii 5–9 lin. longi, interdum uti ramuli obscure papilloso-puberuli; bracteæ bracteolæque lanceolato-subulatæ, infimæ ad 3 lin. longæ. *Flores* 2 vel plures ad apices ramulorum brevium bracteatorum sessiles. *Receptaculum* globosum, ½ lin. altum. *Calycis* segmenta late ovata, acuta, ½ lin. longa. *Corollæ* tubus tenuis, cylindricus, 6–7 lin. longus; lobi lineares, acuti, 4–5 lin. longi, basi papillosi. *Antheræ* ad 3 lin. longæ. *Stylus* 4 lin. e corollæ tubo exsertus, tandem ad 1½ lin. divisus.

Sinoe Basin, *Whyte.*

Ixora atrata, *Stapf* (sp. nov.); affinis *I. Soyauxii*, Hiern, differt ramulis strictis divaricatis, foliis glaberrimis, nervis venisque infra pulchre prominulis, alabastris acuminatis, corollæ segmentis longioribus.

Planta præter inflorescentias petiolosque interdum parce pilosulos glaberrima, exsiccando nigricans. *Ramuli* graciles, teretes. *Folia* elliptico-lanceolata vel oblongo-lanceolata, acuminata, basi acuta, 3½–4½ poll. longa, 1¼–2 poll. lata, membranacea, nervis lateralibus utrinque 4–5 valde obliquis sub margine arcuato connectis uti venis transversis subtus prominentibus; petioli 1½–3 lin. longi, graciles; stipulæ e basi latissima brevi abrupte tenuissime subulatæ ad 2½ lin. longæ. *Cymæ* laxæ, trichotomæ, paucifloræ ad ramulorum apices; pedunculi graciles, 4–9 lin. longi, uti rami et pedicelli glabri vel parce rufo-pilosuli; rami 2–4 lin. longi; bracteæ lanceolatæ vel subulatæ, parvæ; pedicelli ad 2½ lin. longi. *Receptaculum* vix ½ lin. longum. *Calyx* vix ½ lin. longus, segmentis ovatis obtusis vel acutis. *Corollæ* tubus 2½–3 lin. longus, cylindricus, superne paulo dilatatus; lobi oblongi, 4 lin. longi.

Within 6 miles of Monrovia, *Whyte.*

Coffea nudiflora, *Stapf* (sp. nov.); affinis *C. melanocarpæ*, Hiern, sed floribus folia præcedentibus, corolla ore glabra, fructibus rubris distincta; a *C. divaricata*, K. Schum., et

C. rupestri, Hiern, quibus habitu simillima, imprimis calyculo minuto differt.

Planta glaberrima. *Rami* graciles, cortice cinerascente vel albicante. *Folia* decidua oblonga vel ovata vel obovato-oblonga, acuminata, basi acuta, 3½–5 poll. longa, 1½–1¾ poll. lata, tenuiter membranacea, nervis lateralibus utrinque 5 obliquis arcuato-connectis ut venis tenuissimis; petioli 1½–2 lin. longi; stipulæ e basi lata subito subulato-contractæ vel apiculatæ, ad 1 lin. longæ, deinde induratæ albicantes. *Flores* in ramis annotinis ante folia hornotina evoluti, solitarii vel bini in ramulis brevissimis sessiles; bracteæ infimæ (2 paria) membranaceæ in annulum brevem subbilobum connatæ, summæ (2 paria) calyculum formantes magis minusve herbaceæ, ovatæ, acutæ, plerumque parvæ, rarius in folia parvula ecrescentes. *Calyx* truncatus annuliformis. *Corollæ* glabræ tubus cylindricus, 1 poll. longus; lobi elliptico-oblongi, 2½ lin. longi; lobi 6, oblique truncato-elliptici, 3½–4 lin. longi. *Antheræ* inclusæ, 1½ lin. longæ. *Stigma* inclusum. *Fructus* ruber, globosus, 2–2½ lin. diametro.

Within 6 miles of Monrovia and in the Sinoe Basin, *Whyte.*

Coffea ligustrifolia, *Stapf* (sp. nov.); affinis *C. scandenti*, K. Schum., sed ramis rigidis angulo recto divaricatis, foliis angustioribus, calyculi bracteis summis foliaceis, calycis margine crenato corollæ tubo multo longiore.

Rami uti tota planta glaberrimi, cortice castaneo tecti, angulo recto divaricati. *Folia* sempervirentia lanceolata, obtusiuscule acuminata, basi acuta, 2½–3 poll. longa, ¾ ad fere 1 poll. lata, subcoriacea, nervis lateralibus utrinque 4–5 sub margine eleganter arcuato-connectis uti venarum reticulatione utrinque prominulis; petioli 1 lin. longi; stipulæ brevissimæ, latæ, apiculatæ. *Flores* solitarii vel bini, axillares sessiles; bracteæ infimæ (2 paria) in annulum obscure bilobum connatæ, summæ (2 paria) calyculum formantes foliaceæ, ellipticæ vel ovato-ellipticæ, acutæ, ad 3 lin. longæ. *Calyx* brevissimus crenulatus. *Corollæ* glabræ tubus tenuiter infundibuliformis, ad 7 lin. longus, ore fere 2 lin. diametro; lobi 5 lineari-oblongi, 5½ lin. longi. *Antheræ* exsertæ 2½ ad fere 3 lin. longæ. *Stigma* corollæ os 3–4 lin. excedens.

Sinoe Basin, *Whyte.*

Tylophora liberica, *N. E. Brown* (sp. nov.); *T. conspicuæ*, N. E. Br., simillima, sed glabra et lobis basalibus foliorum brevioribus.

Caulis scandens, glaber. *Folia* glabra; petiolus $\frac{1}{2}$–1 poll. longus; lamina $3\frac{3}{4}$–$4\frac{1}{4}$ poll. longa, 2–$2\frac{1}{3}$ poll. lata, oblonga vel elliptico-oblonga, acuta vel acuminata, basi cordata vel emarginata, lobis vel auriculis ad $\frac{1}{6}$ poll. longis. *Pedunculi* ad flexuras racemum brevem sessilem gerentes, glabri. *Pedicelli* 4–5 lin. longi, glabri. *Sepala* $\frac{3}{4}$ lin. longa, ovata, glabra. *Corollæ* lobi 2 lin. longi, $1\frac{3}{4}$ lin. lati, oblique elliptico-oblongi, apice rotundati. *Coronæ* tuberculi subglobosi, fusci. *Columna staminum* basi non dilatata.

Sinoe Basin, *Whyte*.

Lankesteria brevior, *C. B. Clarke* (sp. nov.); *L. eleganti*, T. Anders., affinis, sed corollæ tubo multo breviore distincta.—*L. elegans*, C. B. Clarke, in Dyer, Fl. Trop. Afr. v. p. 70, pro parte.

Rami imo in parte superiore lignescentes. *Folia* anguste obovata (in *L. eleganti* elliptica, apice magis acuminata). *Strobili bracteæ* iis *L. elegantis* similes, sed plus minus pubescentes, in margine ciliato-villosæ. *Calyx* $\frac{1}{4}$ poll. longus, aut parum longior. *Corolla* alba, in centro lutescens (teste W. H. Johnson); tubus $\frac{2}{3}$ poll. longus vel brevior (in *L. eleganti* 1 poll. longus vel ultra), limbi lobi quam *L. elegantis* minores. *Antheræ* e corollæ tubo brevissime exsertæ. *Capsula* $\frac{2}{5}$ lin. longa stipite cylindrico, apice rotundata, complanata, copiose hygroscopice hirsuta.

Near Monrovia, *Whyte*. Also in the following localities:—Gold Coast, Akim, *W. H. Johnston*, 257, 261, and without precise locality, *Burton* and *Cameron*. Ashanti Country, near Kumassi, *Cummins*, 50, 199. Cameroons, in primeval forest, *Staudt*, 538 (issued as *L. Barteri*, Hook. f.).

AFRODAPHNE, *Stapf* (gen. nov. Lauracearum).

Affinis inter *Lauraceas* gerontogeas *Beilschmiediæ*, Nees, differt receptaculo cupulari vel turbinato distincto, filamentis pro ratione brevioribus vel subnullis, ovario in receptaculo subimmerso, paniculis laxioribus, sæpe amplis; inter neogeas accedit ad *Hufelandiam*, Nees, et *Aioueam*, Aubl., sed a priore receptaculo, ab altera perianthio magis herbaceo, receptaculo haud carnoso-incrassato nec persistente recedit.

Flores hermaphroditi. *Perianthium* herbaceum, post anthesin totum deciduum; receptaculum cupulare vel turbinatum; segmenta 6, æqualia, parva. *Stamina* ordinis primi et secundi æqualia, fertilia, basi eglandulosa, magis minusve papilloso-pilosula; filamenta lata, brevia vel subnulla; antheræ late ovatæ vel subquadratæ, introrsum 2-locellatæ; stamina tertii ordinis vel fertilia filamento distincto subcylindrico pilosulo, antheris extrorsum 2-locellatis, vel at filamenta conica brevia dense papillosa circa ovarium in conum conniventia reducta, semper basi utrinque glandula carnosa crassa instructa; stamina quarti ordinis semper sterilia, vel ad fila pilosula vel ad glandulam cordatam carnosam reducta. *Ovarium* sessile in receptaculi basin subimmersum, anguste ovoideum, sensim in stylum longiusculum gracilem attenuata. *Drupa* pedicello haud incrassato insidens, basi nuda, oblonga. *Semen* cotyledonibus magnis plano-convexis corculum parvum includentibus.

Arbores vel frutices, gemmis nudis sericeo-velutinis. *Folia* alterna, rarius nonnulla subopposita, coriacea glabra, pennivenia. *Flores* parvi vel minimi in paniculas multifloras laxiusculas axillares parce vel vix bracteatas dispositi, pedicellis brevibus vel longiusculis.

Species circiter 15, omnes Africæ occidentalis.

Although very homogeneous in general appearance, the genus consists of two clearly distinct sets which may be treated as sections, the difference being chiefly in the presence of 9 or of 6 fertile stamens. Where the third series of stamens is reduced to staminodes, the latter connive more or less into a cone surrounding the ovary. I propose for these sections the names *Ennearrhena* and *Hexarrhena* respectively, the names explaining themselves.

To the section *Ennearrhena* I refer the following species:—

1. A. ELATA, *Stapf* (=Beilschmiedia elata, *Scott Elliot*).
2. A. FRUTICOSA, *Stapf* (= Beilschmiedia fruticosa, *Engl.*).
3. A. GRANDIFOLIA, *Stapf* (=Cryptocarya ? grandifolia, *Engl.*).
4. A. MANNII, *Stapf* (=Beilschmiedia Mannii, *Hook. f.*=Oreodaphne Mannii, *Meissn.*).
5. A. MINUTIFLORA, *Stapf* (=Beilschmiedia minutiflora, *Hook. f.* =Oreodaphne minutiflora, *Meissn.*).
6. A. NITIDA, *Stapf* (=Beilschmiedia nitida, *Engl.*).
7. A. PREUSSII, *Stapf* (=Beilschmiedia Preussii, *Engl.*).
8. A. SESSILIFOLIA, *Stapf* (=Beilschmiedia sessilifolia, *Engl.*).
9. A. STAUDTII, *Stapf* (=Beilschmiedia Staudtii, *Engl.*).
10. A. ZENKERI, *Stapf* (=Beilschmiedia Zenkeri, *Engl.*).

To the section *Hexarrhena* belong:—

11. AFRODAPHNE CALABARICA, *Stapf* (*Mann*, 2255, in part).
12. A. CAUDATA, *Stapf* (see below).
13. A. EURYNEURA, *Stapf* (see below).
14. A. GABOONENSIS, *Stapf* (=Beilschmiedia gaboonensis, *Hook. f.* =Oreodaphne gaboonensis, *Meissn.*).
15. A. OBSCURA, *Stapf* (=Beilschmiedia obscura, *Engl.*).

Afrodaphne caudata, *Stapf* (sp. nov.); inter species sectionis *Hexarrhenæ* floribus majusculis, staminibus quarti ordinis ad filamenta pilosa eglandulosa distincta.

Folia oblonga, caudato-acuminata acumine acuto ultrapollicari, basi obtusa, 9 poll. (vel ultra) longa, ad 3½ poll. lata, coriacea, glaberrima, lucidula, nervis lateralibus utrinque circiter 8 arcuato-connectis, nervo collectivo submarginali altero addito, utrinque pulchre laxe reticulata; petioli crassi, 3 lin. longi. *Paniculæ* laxæ, ad 8 poll. longæ, superne fulvo-puberulæ; pedunculi ad 3 poll. longi; bracteæ paucæ, deciduæ, ovatæ, concavæ, ad 2 lin. longæ, dorso fulvo-tomentellæ; pedicelli 1–2 lin. longi. *Perianthium* turbinatum, 1½ lin. longum, extus fulvo-tomentellum; receptaculum ¾ lin. altum, basi haud constrictum; lobi ovati, subacuti. *Stamina* primi et secundi ordinis filamentis brevissimis ad loborum bases insertis, antheris apiculatis apice papillosis; tertii ordinis ad staminodia anguste conica dense papillosa reducta, glandulis majusculis; quarti ordinis ad filamenta pilosula basi eglandulosa reducta. *Pistillum* e flore haud exsertum.

Sinoe Basin, *Whyte*.

A. euryneura, *Stapf* (sp. nov.), affinis *A. gaboonensi*, Stapf, differt foliis majoribus basi rotundatis nervis lateralibus distantibus, paniculis majoribus.

Folia oblonga, breviter tenuiterque acuminata vel fere aristulata, basi rotundata, ad 8 poll. vel ultra longa, ad 3¼ poll. lata, coriacea, glabra, nervis lateralibus utrinque circiter 8 arcuato-connectis subtus valde prominentibus, nervo collectivo submarginali altero addito (haud semper conspicuo), venarum reticulatione laxa utrinque prominula; petioli ad 6 lin. longi, crassi. *Paniculæ* 4–8 poll. longæ, laxæ, superne fulvo-cinereo-puberulæ; pedunculi 1–3 poll. longi; bracteæ paucæ, ovatæ, acutæ, concavæ, ad 2 lin. longæ, dorso fulvo- vel cinereo-tomentellæ; pedicelli graciles, 1 lin. longi. *Perianthium* breviter turbinato-globosum, vix 1 lin. longum, extus fulvo-cinereo-tomentellum; receptaculum $\frac{2}{3}$–$\frac{3}{4}$ perianthii altitudine; lobi late ovati, subacuti. *Stamina* primi et secundi ordinis filamentis brevissimis ad loborum bases inserti antheris exapiculatis apice papillosis; tertii ordinis ad staminodia conica dense papillosa reductis glandulis crassissimis; quarti ordinis ad glandulam cordatam carnosam apice et secundum lineam mediam utrinque papillosam reducta. *Pistillum* stylo apice jam ante flores apertos exserto.

Sinoe Basin, *Whyte.*

Cleistanthus liberica, *N. E. Brown* (sp. nov.); affinis *C. angolensi,* Muell. Arg., cortice cinereo, cuspide foliorum longiore angustioreque distincta.

Cortex cinereus, nec brunneus. *Folia* alterna, breviter petiolata, $2\frac{1}{2}$–$3\frac{1}{2}$ poll. longa, $1\frac{1}{8}$–$1\frac{3}{4}$ poll. lata, oblonga vel elliptico-oblonga, cuspidato-acuminata, basi obtusa vel late cuneata, glabra cuspide 7–9 lin. longa basi $1\frac{1}{2}$–2 lin. lata lineari obtusa, *Racemi* $\frac{3}{4}$–1 poll. longi, ferrugineo-puberuli. *Flores* ♂ fasciculati. *Pedicelli* $1\frac{1}{2}$–2 lin. longi. *Sepala* $1\frac{3}{4}$ lin. longa, lineari-oblonga, acuta. *Petala* minuta, vix $\frac{1}{2}$ lin. longa, linearia, apice dentata, glabra. *Discus* crassus, integer, apice dense pubescens. *Flores* ♀ non vidi.

Sinoe Basin, *Whyte.*

Phyllanthus profusus, *N. E. Brown* (sp. nov.); *P. floribundo,* Muell. Arg., habitu simillimus, differt foliis ovatis acuminatis, floribus numerosioribus albidis vel pallide viridescentibus.

Rami foliiferi $3\frac{1}{2}$–5 poll. longi, glabri. *Folia* breviter petiolata, $\frac{3}{4}$–3 poll. longa, $\frac{3}{4}$–$1\frac{1}{2}$ poll. lata, ovata vel elliptico-ovata, acute acuminata, glabra, subtus pallida. *Flores* ♂ numerosissimi fasciculati, albi vel pallide viridescentes, glabri; fasciculi in racemos interruptos fasciculatos $2\frac{1}{2}$–5 poll. longos dispositi. *Pedicelli* 1–2 lin. longi. *Sepala* 4, $\frac{1}{3}$–$\frac{1}{2}$ lin. longa, elliptico-oblonga, obtusa. *Glandulæ* 4, minutissimæ. *Stamina* 4, libera. *Flores* ♀ non vidi.

Sinoe Basin, *Whyte.*

Croton dispar, *N. E. Brown* (sp. nov.); *C. macrostachyo,* A. Rich., habitu similis sed gracilior et glabrior.

Rami floriferi 1 lin. crassi, minute et sparse ferrugineolepidoti, demum glabri. *Folia* elliptico-ovata vel oblonga, obtuse subcuspidato-acuminata, basi leviter emarginata vel latissime rotundata, triplinervia, utrinque fere glabra, squamulis minutis stellatis sparsissime conspersa; petiolus $\frac{1}{2}$–1 poll. longus; lamina $2\frac{1}{4}$–3 poll. longa, $1\frac{1}{6}$–2 poll. lata. *Racemus* terminalis, solitarius, 5–6 poll. longus. *Flores* masculi 5-meri; femineos non vidi. *Pedicelli* 2 lin. longi, minutissime stellato-puberuli. *Sepala et petala* 5, revoluto-reflexa, subæqualia, fere 1 lin. longa; sepala subacuta, glabra, apice ciliata; petala obtusa, dorso glabra, intra lanata. *Glandulæ* 5, subulatæ. *Stamina* 10–11; filamenta $1\frac{1}{2}$ lin. longa, glabra. *Receptaculum* pilosum. *Ovarium* rudimentum nullum.

Near Monrovia, *Whyte.*

Crotonogyne caterviflora, *N. E. Brown* (sp. nov.); proxima *C. Mannianæ*, Muell. Arg., sed foliis basi rotundatis nec longe cuneato-acutis, et racemis multo brevioribus distincta.

Folia oblongo-oblanceolata, breviter acuminata, basi obtuse rotundata, utrinque sparsissime lepidota vel supra fere glabra; petiolus 5–8 lin. longus; lamina 4–7 poll. longa, $1\frac{1}{2}$–$2\frac{2}{3}$ poll. lata. *Racemi* masculi 2–6 poll. longi, dissite glomeruliflori, lepidoti; femineos non vidi. *Pedicelli* $\frac{1}{2}$–1 lin. longi, dense lepidoti. *Sepala* 3, subinæqualia, 1–$1\frac{1}{4}$ lin. longa, elliptica, densissime lepidota. *Petala* 5, elliptica, obtusa, $1\frac{1}{4}$ lin. longa, glabra. *Stamina* 15; filamenta $\frac{1}{3}$–$\frac{1}{2}$ lin. longa, basi dilatata, connata.

Sinoe Basin, *Whyte.*

Erythrococca aculeata, *Benth.*, var. **acutissima**, *N. E. Brown* (var. nov.); ab typo differt foliis acutissime (nec obtuse) acuminatis.

Around Monrovia, *Whyte.*

Hæmanthus longitubus, *C. H. Wright* (sp. nov.); affinis *H. multifloro*, Martyn, perianthii tubo multo longiore differt.

Folia elliptica, breviter abrupteque acuminata, tenuiter membranacea, 6 poll. longa, $2\frac{1}{2}$ poll. lata; petioli $1\frac{1}{4}$ poll. longi; vaginæ 3 poll. longæ, maculatæ. *Pedunculus* lateralis, 8 poll. longus, multiflorus; spathæ e basi ovata longe acuminatæ, rubræ; pedicelli tenues, 6 lin. longi. *Perianthium* rubrum; tubus cylindricus, tenuis, 14 lin. longus; segmenta linearia, tubo æquilonga, ½–¾ lin. lata, 1-nervia. *Stamina* perianthii segmentis æquilonga. *Ovarium* trilobum; ovula solitaria.

Sinoe Basin, *Whyte.*

This species, at first sight, much resembles the widely-spread *H. multiflorus*, Martyn, which is distinguished by its perianth not exceeding half an inch in length.

Dracæna prolata, *C. H. Wright* (sp. nov.); a *D. bicolore*, Hook., foliis basi non longe attenuatis, vaginis parvis, petiolisque brevioribus crassioribus differt.

Caules læves, siccando straminei, nitidi. *Folia* elliptica, basi apiceque breviter acuminata, obtusa, coriacea, circa 7 poll. longa, 3 poll. lata; petioli superiores ad 1 poll. longi. *Panicula* brevis, congesta; bracteæ late triangulares, acutæ; pedicelli 2 lin. longi. *Perianthii* tubus cylindricus, 3 lin. longus, ½ lin. diam.; segmenta oblonga, apice cucullata, mucronata, 4 lin. longa, 1 lin. lata. *Antheræ* oblongæ, 1¼ lin. longæ. *Ovarium* ovoideum; stylus antheras paullo superans.

Sinoe Basin, *Whyte*; within 6 miles of Monrovia, *Whyte.*

Culcasia liberica, *N. E. Brown* (sp. nov.); affinis *C. scandenti*, Beauv., differt caule crassiore, foliis majoribus, floribus numerosioribus.

Caulis ¼ poll. crassus. Folia lanceolata vel elliptico-lanceolata, acuta vel subcuspidata, basi cuneata; petiolus 4½–5 poll. longus; lamina 8–9 poll. longa, 3–3½ poll. lata. *Pedunculi* 7–8 in fasciculos terminales dispositi, 1½–2¾ poll. longi, 1–1⅛ lin. crassi. *Spatha* 1¾ poll. longa; tubus ovoideus; lamina cymbiformis, subacuta. *Spadix* e spatha exserta, 2 poll. longa, parte feminea 2–2½ lin. longa, subglobosa, parte mascula a feminea longe distante, cylindrico-clavata. *Ovarium* subglobosum; stigma sessile.

Sinoe Basin, *Whyte.*

P.S.—The specimens mentioned on pp. 89 and 94 as collected by H. Reynolds form part of a small collection received at Kew since this paper was read.

12th May, 1905. O. Stapf.

INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

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BOTANY

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B. DAYDON JACKSON,
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æquilonga, $\frac{1}{2}$–$\frac{3}{4}$ lin. lata, 1-nervia. *Stamina* perianthii segmentis æquilonga. *Ovarium* trilobum; ovula solitaria.

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This species, at first sight, much resembles the widely-spread *H. multiflorus*, Martyn, which is distinguished by its perianth not exceeding half an inch in length.

Dracæna prolata, *C. H. Wright* (sp. nov.); a *D. bicolore*, Hook., foliis basi non longe attenuatis, vaginis parvis, petiolisque brevioribus crassioribus differt.

Caules læves, siccando straminei, nitidi. *Folia* elliptica, basi apiceque breviter acuminata, obtusa, coriacea, circa 7 poll. longa, 3 poll. lata; petioli superiores ad 1 poll. longi. *Panicula* brevis, congesta; bracteæ late triangulares, acutæ; pedicelli 2 lin. longi. *Perianthii* tubus cylindricus, 3 lin. longus, $\frac{1}{2}$ lin. diam.; segmenta oblonga, apice cucullata, mucronata, 4 lin. longa, 1 lin. lata. *Antheræ* oblongæ, 1$\frac{1}{4}$ lin. longæ. *Ovarium* ovoideum; stylus antheras paullo superans.

Sinoe Basin, *Whyte*; within 6 miles of Monrovia, *Whyte.*

Culcasia liberica, *N. E. Brown* (sp. nov.); affinis *C. scandenti*, Beauv., differt caule crassiore, foliis majoribus, floribus numerosioribus.

Caulis $\frac{1}{4}$ poll. crassus. Folia lanceolata vel elliptico-lanceolata, acuta vel subcuspidata, basi cuneata; petiolus 4$\frac{1}{2}$–5 poll. longus; lamina 8–9 poll. longa, 3–3$\frac{1}{2}$ poll. lata. *Pedunculi* 7–8 in fasciculos terminales dispositi, 1$\frac{1}{2}$–2$\frac{3}{4}$ poll. longi, 1–1$\frac{1}{2}$ lin. crassi. *Spatha* 1$\frac{3}{4}$ poll. longa; tubus ovoideus; lamina cymbiformis, subacuta. *Spadix* e spatha exserta, 2 poll. longa, parte feminea 2–2$\frac{1}{2}$ lin. longa, subglobosa, parte mascula a feminea longe distante, cylindrico-clavata. *Ovarium* subglobosum; stigma sessile.

Sinoe Basin, *Whyte.*

[P.S.—The specimens mentioned on pp. 89 and 94 as collected by H. Reynolds form part of a small collection received at Kew since this paper was read.

12th May, 1905. O. STAPF.]

The Botany of the Anglo-German Uganda Boundary Commission.

By E. G. Baker, F.L.S.; S. Moore, F.L.S.; and A. B. Rendle, M.A., D.Sc., F.L.S.

(Plates **1–4**.)

[Read 16th February, 1905.]

The collections which form the subject of this paper were made by Dr. A. G. Bagshawe, medical officer to the recent Anglo-German Uganda Boundary Commission under H.M. Commissioner, Lieut.-Col. Delmé-Radcliffe. Beginning at the mouth of the Kagera River, on the south-western boundary of the Uganda Protectorate, at a point where the river empties itself into the Victoria Nyanza on the west side, a camp was made for three months. The second collecting-centre, about 60 miles from the lake, was Mulema in South Ankole, lat. 1° S., long. 31° E., where there was also a camp for about three months till the middle of 1903. Barumba, where a few plants were collected, is fifteen miles further west. The next collecting-centre was the district of the high hills of Ruchigga (lat. 1°–1° 10′ S., long. 30°–30° 15′ E.) from 5500–7800 ft., which drains into the Congo. With this exception, all the plants in the collection are from lands which drain into the Nile. Two visits were paid to an isolated hill, Irunga, alt. 7160 ft., which lies at the intersection of the English, German, and Congo boundaries. The River Rufúa, which drains Lake Karenge, and is in long. 30° 6′ E., and lat. 0° 55′ S., and runs S.E. to join the Kagera River, was also visited. The next important collecting-centre was the island of Buvúma, opposite the exit of the Nile from the Victoria Nyanza, where a stay of about three weeks was made. Buvúma is about the size of the county of Rutland. It is hilly, the highest point being 600 feet above the level of the lake; about half the island is thickly wooded. The inhabitants differ considerably from those of the mainland—their language is different and allied to that of the Basoga. Sir Harry Johnston, who recently visited the island, suggests that it may have been separated from the mainland for a sufficient period to acquire or retain peculiar forms of vegetation.

The earliest collection made in the Uganda Protectorate was that by Col. Grant, on the Speke and Grant Expedition of 1860* partly on the north-western shore of the Victoria Nyanza, between what was then called the river Kitangule (now called Kagera) and M'tesas. Other collectors who have visited this region are Mr. G. F. Scott Elliot on his return from his expedition to Mt. Ruwenzori, and Dr. Stuhlmann on the Emin Pasha Expedition. Lieut. Stairs, on the Stanley Expedition in 1890, and several others have also collected plants in Uganda.

In Sir Harry Johnston's book on Uganda†, Mr. C. H. Wright, A.L.S., has given a list of the plants known from the Protectorate.

Sir Harry Johnston recognises five Botanical Regions in the Uganda Protectorate:—

(1) SOMALI REGION.—Includes the arid country in the basin of Lake Rudolf and up the Rift Valley as far as the north end of Lake Baringo.

(2) EAST AFRICAN REGION.—A land of grass, *Borassus*, *Hyphæne*, and wild Date Palms, &c. characteristic of the low-lying parts of German, Portuguese, and British East Africa.

(3) CENTRAL AFRICAN REGION.—This fertile region presupposes an average altitude of 3500 ft. in the equatorial regions of Uganda.

(4) WEST AFRICAN FOREST REGION. — Characteristic of the countries near the shore of the Victoria Nyanza.

(5) PLATEAU OR ALPINE REGION.—Everywhere between 6500 and 10,000 ft., with a flora which alternately recalls the trees and plants of temperate South Africa and temperate Abyssinia.

The island of Buvúma comes under the West African Forest Region, the higher portion of the Ruchigga district and the hill Irunga reach the Alpine Region; but much of the country covered by the Expedition is in the Central African Region.

As a whole, the entire country explored lies in the northern part of the Central Lake Region, Engler's "Seengebiet," representing that portion of it which is included in the Nile Land District of Oliver's 'Flora of Tropical Africa.'

The collection comprises 480 species of Seed-plants, of which 67 are new to science, and includes 433 Dicotyledons, 46 Monocotyledons, and one Gymnosperm (*Podocarpus milanjiana*). Of the Dicotyledons 199 belong to the Polypetalæ, 183 to the Gamopetalæ, and 51 to the Apetalæ, as recognised in Bentham & Hooker's 'Genera Plantarum.' The Monocotyledons include 30 Orchids, and also members of other petaloid orders; no sedges nor grasses were collected.

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* Botany, by Prof. D. Oliver, in Trans. Linn. Soc. vol. xxix. (1872-5).

† Sir Harry Johnston: The Uganda Protectorate, 1902.

Taken as a whole, the plants show considerable affinity with the Floras of the West African Coast-region, especially Angola; about 20 per cent. comprising species hitherto known only from those regions, or new species with a strong West African affinity. Recent investigation has revealed the same state of things as far eastward as Usambara *. Noteworthy examples of this among the Polypetalæ are a new variety of *Capparis Afzelii*, a species hitherto known only from Sierra Leone and the Cameroons; a form of *Polygala Gomesiana*, an Angolan plant; *Hugonia platysepala* (Upper and Lower Guinea); and *Zanthoxylon nitens*, *Clausena anisata* var. *multijuga*, and *Illigera pentaphylla*, all three Angolan. Among the Gamopetalæ the following eight species are worthy of mention as having hitherto been known only from Upper Guinea :—*Craterispermum brachynematum*, *Clitandra cymulosa*, *Alafia grandis*, *A. Schumannii*, *A. landolphioides*, *Baissea tenuiloba*, *Acanthopale decempedalis*, *Barleria opaca*. To the same category belong *Peddiea longiflora* (Togoland), *Claoxylon africanum* and *Habenaria Soyauxii* (Gaboon), a new *Polystachya* (*P. inconspicua*) near the Fernando Po species *P. alpina*, and a new species of *Hæmanthus* (*H. Radcliffei*) nearly allied to *H. Lindeni* from the Congo. The Angolan affinity is exemplified by several orchids—*Eulophia dichroma*, *Habenaria foliosa*, *Disa ochrostachya*, and a new species of *Mystacidium* (*M. ugandense*).

Excluding widely distributed tropical species, the majority of the plants represent an Eastern tropical African element, including a number of Abyssinian types, a few species hitherto known only from Mt. Kilimanjaro on the East (such as *Tragia Volkensii*), and several from Mt. Ruwenzori on the West, such as the Composites *Crassocephalum ruwenzoriense* and *Senecio ruwenzoriensis*, and *Liparis ruwenzoriensis*, *Pteroglossaspis ruwenzoriensis*, *Polystachya nigrescens*, and *Disa erubescens*, four orchids previously collected by Mr. Scott Elliot. A more southern element is represented by a few Nyassa-land types, such as *Eulophia missionis*, *Lissochilus Nyasæ*, and *Senecio sabulicolus*.

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* Engler, in Notizbl. k. Bot. Gart. Berlin, iii. 83.

There is a slight South-African affinity, the most marked examples of which are a new species of *Pappea* allied to *P. capensis*, *Pavetta assimilis*, and *Chætacanthus Persoonii*; the last two have not previously been found north of the Tropics.

ENUMERATION OF SPECIES.

DICOTYLEDONES POLYPETALÆ.

(By Edmund G. Baker.)

Ranunculaceæ.

Clematis Stuhlmanni, *Hieron. in Engler, Pflanzenwelt Ost-Afr.* C. 180.

Irunga. Fl. November, 381.

Distrib. Karagwe in the Central African Lake-Region.

C. orientalis, *Linn. Sp. Pl.* 543.

Fl. April, 202.

Native name "Munkamba." "Flowers pinkish."

Var. γ. Thunbergii, *O. Kuntze, in Verh. Bot. Brand.* xxvi. (1885) 124.

Ruchigga. Fl. November, 439.

"Trailing with white flowers."

Var. ε. Wightiana, *O. Kuntze, l. c.*

Hillside, Simba. Fl. February, 172. Hillside, Burumba. Fl. July, 374.

Native name "Lumama." "Climber with white flowers."

Distrib. C. orientalis is widely spread in Temperate Asia, Northern India, &c.

Thalictrum rhynchocarpum, *Dillon & A. Rich. in Ann. Sc. Nat.* sér. II. xiv. (1840) 262.

Ruchigga. Fr. November, 456.

"Erect plants 5 ft. high, with inconspicuous flowers."

Distrib. Mountains of Tropical Africa; also occurs south of the Tropic, in Natal, &c.

Ranunculus membranaceus, *Fres. in Mus. Senckenb.* ii. (1837) 270; R. pinnatus, *Oliver, in Trans. Linn. Soc.* xxix. (1872) tab. 2, *non Poir.*

River Rufúa, at edge of pool. December, 534.

Distrib. Nile Land, Lower Guinea, Mozambique District; also in South Africa.

DILLENIACEÆ.

TETRACERA ALNIFOLIA, *Willd. Sp. Pl.* ii. 1243.

Island of Buvúma, Victoria Nyanza. March, 602.

Distrib. Upper Guinea. The Welwitsch plant from Golungo Alto, no. 1203, formerly referred to *T. alnifolia*, Willd., is regarded by Dr. Gilg as a distinct species, *T. podotricha*, Gilg.

ANONACEÆ.

UVARIA WELWITSCHII, *Engler & Diels, Monogr.* 18.—Oxymitra? Welwitschii, *Hiern, in Welw. Cat.* 10.

In gully above Mulema, Fl. April, 244; also Fr. April, 245.

Native name "Mukamira." "Shrub with greenish-yellow flowers and yellow fruits. Fruit eaten. Wood used in hut-building."

The following is a description of the flowering specimen which, although the type comes from a very different locality, I have referred to this species. It has previously been collected only in fruit:—

Frutex ramis demum glabris atropurpureo-corticatis; foliorum petiolo brevi incrassato ± 2 mm. longo; lamina subcoriacea, supra glabra, subtus præter costam glabra, oblonga, apice obtusa, basi late cuneata vel rotundata, 9–12 cm. longa, 3·5–4·5 cm. lata; costa subtus prominente, nervis lateralibus utrinque 10–14 adscendentibus subtus subprominentibus; floribus solitariis sæpissime terminalibus inter mediocres generis; sepalis late ovatis subacutis 11–13 mm. longis quam petala brevioribus; petalis subæqualibus ovato-suborbicularibus extus fusco-tomentellis, longioribus quam latis, ± 14–16 mm. longis, 12–14 mm. latis; staminibus brevissimis, ± 1 mm. longis, connectivo obliquo; carpellis extus fusco-tomentosis.

Distrib. Angola.

U. BUKOBENSIS, *Engler, in Pflanzenwelt Ost-Afr.* C. 178.

Island of Buvúma. Fl. March, 639.

"Shrub with greenish flowers."

Distrib. Central African Lake-Region.

UVARIA sp.

Island of Buvúma. Fl. March, 642.

"Shrub with yellow flowers."

Further material is necessary of this species.

Folia oblonga vel ovato-oblonga glabra, 9–11 cm. longa, 3–4 cm. lata, subcoriacea. Petiolus brevissimus 2–3 mm. longus. Calyx 12–13 mm. longus. Petala subæqualia quam ea *U. Kirkii*, Oliver, angustiora, 20–22 mm. longa, 15–16 mm. lata.

ARTABOTRYS sp.

Island of Buvúma. Fr. March, 662.

Climbing shrub in fruit only.

Perhaps allied to *A. stenopetala*, Engler, but flowers required to confirm this. Leaves ovate, glaucous-green, smooth.

MENISPERMACEÆ.

TINOSPORA TENERA, *Miers, in Ann. & Mag. Nat. Hist.* ser. III. xiii. (1864) 322.

Island of Buvúma. Fl. March, 658.

" Herbaceous climber with greenish flowers. ♀ only."

Distrib. Nile Land, Mozambique District; also in Madagascar.

FUMARIACEÆ.

FUMARIA OFFICINALIS, *Linn. Sp. Pl.* 700.

Ruchigga. Fl. November, 396.

Distrib. Europe, North Africa, North Asia.

CRUCIFERÆ.

BRASSICA WILLDENOVII, *Boiss. in Ann. Sc. Nat.* sér. II. ii. (1842) 88.

Near Mulema. Fl. June, 344.

Distrib. Asia, temp. and trop. Nile Land, Lower Guinea, Mozambique District.

CAPPARIDACEÆ.

CLEOME MONOPHYLLA, *Linn. Sp. Pl.* 672.

Roadside, Mulema. Fl. June, 326.

Distrib. Widely spread in Tropical Africa; also at the Cape.

C. HIRTA, *Oliver, Fl. Trop. Afr.* i. 81.

Near River Rufúa. Fl. December, 515.

Distrib. Lower Guinea, South Central, Mozambique District.

Maerua angolensis, *DC. Prod.* i. 254.
Near Mulema. Fl. April, 210.
Native name "Mweogola." "Low tree with much contorted branches; flowers greenish yellow."
Distrib. Upper Guinea, Nile Land, Lower Guinea.

M. triphylla, *A. Rich. Tent. Fl. Abyss.* i. 32, tab. 7.
Near Mulema. Fl. April, 217.
Native name "Moywante." "Low shrub with white flowers."
Distrib. Nile Land.

Cadaba farinosa, *Forsk. Fl. Ægypt.-Arab.* 68.
Near Kikobe ferry, River Kagera. Fl. March, 176.
Native name "Kakubanga." "Wood used to make cattle-kraals. Shrub; flowers green."
Distrib. Widely distributed in Tropical Africa.

Boscia salicifolia, *Oliver, Fl. Trop. Afr.* i. 93.
Hillside near Mulema. Fl. June, 341.
"Tree-like shrub with girth of 6 ft. and greenish flowers." A form with generally 6 stamens.
Distrib. Nile Land, Lower Guinea, Mozambique District.

Capparis spinosa, *Linn. Sp. Pl.* 503.
Near Mulema. Fl. April, 223.
Distrib. Spreading through the Mediterranean Region and Egypt it extends eastwards to Western India. Also Nile Land.

C. tomentosa, *Lam. Encyc. Méth.* i. 606.
Hillside, Mulema. Fl. April & May, 225 & 281.
Native names "Mutatsi" and "Mukoma."
Distrib. Widely spread in Tropical Africa.

C. Rothii, *Oliver, Fl. Trop. Afr.* i. 97.
Near Mulema. Fl. March & April, 187 & 237.
Distrib. Nile Land.

C. erythrocarpos, *Isert, in Ges. Naturf. Fr. Berl. Schrift.* ix. (1789) 334, tab. 9.
Island of Buvúma. Fl. March, 623.
Distrib. Upper Guinea, Nile Land, Lower Guinea.

C. Afzelii, *Pax*, var. nov. buvumensis. Arbor parva glabra, foliis subcoriaceis, oblongis vel ovato-oblongis, breviter petiolatis, stipulis tenuibus, minus acuminatis quam in typo; floribus 1–3 ad apices ramulorum dispositis; bacca subglobosa, lateraliter apiculata, gracillime pedunculata.

Hab. Island of Buvúma, Victoria Nyanza. Fl. March 11th, 1904. 598.

"Low tree not exceeding 20 ft., with white flowers which become purplish."

Distrib. of type. Sierra Leone.

BIXINEÆ.

ONCOBA SPINOSA, *Forsk. Fl. Ægypt.-Arab.* 103.

Mouth of Kagera River. Fl. & Fr. February, 150.

Distrib. Nile Land, Upper Guinea.

PITTOSPOREÆ.

PITTOSPORUM ABYSSINICUM, *Delile, in Ann. Sci. Nat.* sér. II. xx. (1843) 49.

Ruchigga. Fl. & Fr. November, 416 & 452.

Distrib. Nile Land, Lower Guinea.

POLYGALEÆ.

POLYGALA PERSICARIÆFOLIA, *DC. Prod.* i. 326.

Coast of Victoria Nyanza, Uganda. Fl. February, 570.

Distrib. Nile Land, Mozambique District.

The following is also closely allied to this species:—

Ruchigga. Fl. November, 459.

P. VOLKENSII, *Gürke, in Engler, Pflanzenwelt Ost-Afr.* C. 234.

Near River Rufúa. Fl. December, 516.

"Herb with flowers that appear white when fully open."

Distrib. Central African Lake-Region.

P. GOMESIANA, *Welw. ex Oliver, Fl. Trop. Afr.* i. 126; forma nov. UGANDENSIS. Frutex 4-pedalis, foliis quam in typo aliquid crassioribus, sepalorum margine solummodo colorato, capsulis paullulum quam in typo longioribus, ± 5·5 mm. longis, ± 4 mm. latis, alis angustissimis, ± 12 mm. longis, ± 10 mm. latis; seminibus hirsutis.

Ruchigga, alt. 7000 ft. Fl. November, 397.

"Shrub with dark red flowers; usually grows amid bracken."

Distrib. of type. Lower Guinea.

POLYGALA FISCHERI, *Gürke, in Engler, Jahrb.* xiv. (1891) 310; forma.

Kagera Valley near Mulema. Fl. May, 275 & 291.

Native name "Ntanakorogondo." "Herb with lilac-coloured or bluish flowers."

Distrib. East Tropical Africa.

SECURIDACA LONGEPEDUNCULATA, *Fres. in Mus. Senckenb.* ii. (1837) 275.

On hillside, Mulema. Fl. April, 226.

Native name "Mweya." "Low tree used for posts and to make charcoal. Flowers pink (sepals and petals)."

Distrib. Widely distributed in Tropical Africa.

CARPOLOBIA ALBA, *G. Don, Gen. Syst.* i. 370.

Island of Buvúma. Fl. March, 664.

Distrib. Upper Guinea, Lower Guinea.

CARYOPHYLLACEÆ.

CERASTIUM AFRICANUM, *Oliver, Fl. Trop. Afr.* i. 141.

Ruchigga, alt. 7000 ft. Fl. December, 470.

Distrib. Upper Guinea, Mozambique District.

DRYMARIA CORDATA, *Willd. ex Roem. & Schult. Syst.* v. 406.

Ruchigga, alt. 7000 ft. Fl. December, 479.

Distrib. Upper and Lower Guinea, Nile Land; also in Comoros, Madagascar, Tropical Asia, and Tropical America.

PORTULACEÆ.

TALINUM CUNEIFOLIUM, *Willd. Sp. Pl.* ii. 864.

Near Mulema in Kagera Valley. Fl. May, 270.

Native name "Mtainagerom." "Stem chewed for toothache."

Distrib. Widely spread in Tropical Africa.

HYPERICINEÆ.

HYPERICUM PEPLIDIFOLIUM, *A. Rich. Tent. Fl. Abyss.* i. 95.

Ruchigga. Fl. November, 415.

Distrib. Nile Land, Mozambique District.

H. LALANDI, *Choisy, in DC. Prod.* i. 550.

Near mouth of Kagera. Fl. February, 551.

Distrib. Nile Land, Lower Guinea, Cape.

PSOROSPERMUM FEBRIFUGUM, *Spach, in Ann. Sc. Nat.* sér. II. v. (1836) 163.
Near Musozi. Fl. February, 166.
Native name "Kansironsiro."
Near Mulema. Fl. April, 257.
Native name "Mkonya."
"Low shrub with white flowers and red resin."
Distrib. Upper Guinea, Lower Guinea, Mozambique District.

HARONGA PANICULATA, *Lodd. ex Steud. Nom.* ed. II. i. 722.
Coast of Victoria Nyanza, Uganda. Fl. March, 572.
"Shrub with white flowers and red sap."
Tree growing usually in damp soil, Musozi. Fl. & Fr. December, 53.
Native name "Mulidida." "Yields a red gum."
Distrib. Widely spread in Tropical Africa; also in Madagascar and Mauritius.

MALVACEÆ.

SIDA CARPINIFOLIA, *Linn. fil. Suppl.* 307.
Ruchigga. Fl. December, 438.
Distrib. Very widely distributed in Tropical and Subtropical Regions.

ABUTILON INDICUM, *Sweet, Hort. Brit.* ed. I. 54.
Near Mulema. Fl. April, 195.
Native name "Mwema."
Distrib. Widely distributed in the Tropics.

A. ZANZIBARICUM, *Bojer, ex Masters, in Oliver, Fl. Trop. Afr.* i. 186.
Near Mulema. Fl. May, 268.
"Shrubby. Flowers yellow with dark centre."
Distrib. Upper Guinea, Lower Guinea, Mozambique District.

PAVONIA MACROPHYLLA, *E. Meyer, ex Harvey & Sonder, Fl. Cap.* i. 169.
Near Mulema. Fl. May, 319.
Native name "Akonyeshagum."
Distrib. Nile Land, South Central; also at the Cape.

KOSTELETZKYA ADOENSIS, *Masters, in Oliver, Fl. Trop. Afr.* i. 192.

Below Ruchigga, alt. 5000 ft. Fl. December, 492.

Distrib. Nile Land, Mozambique District.

HIBISCUS MICRANTHUS, *Linn. f. Suppl.* 308.

Mulema. Fl. April, 200.

Native name "Kazinga." "Low shrub 3 ft. Grows on ant-hills. Red flower."

Distrib. Widely distributed in the Tropics.

H. GOSSYPINUS, *Thunb. Prodr. Pl. Cap.* 118.

Gully above Mulema. Fl. May, 311.

Native name "Musinga." "Stem used as a tooth-brush and as handles for spears."

Distrib. Widely distributed in Tropical Africa.

H. ÆTHIOPICUS, *Linn. Mant.* ii. 258.

Hillside, Mulema. Fl. April, 228.

Native name "Niakun."

Distrib. Nile Land, Cape.

H. DIVERSIFOLIUS, *Jacq. Ic. Pl. Rar.* t. 551.

Kitura Koki. Fl. August, 380. Lake Shore, Musozi. Fl. February, 155.

Native name "Kagei." "Rope made from the bast."

Ruchigga. Fl. November, 441.

Distrib. Widely distributed in Tropical Africa.

STERCULIACEÆ.

STERCULIA sp.

Island of Buvúma. Fr. March, 656.

Tree, flowers not obtained. Follicles woody, shortly stipitate, covered externally with a close brown tomentum, shortly pointed.

DOMBEYA MASTERSII, *Hook. fil. in Bot. Mag.* tab. 5639 (1867).

Near Kikobe Ferry, R. Kagera. Fl. March, 185.

Native name "Nkarabu." "Bark used to make rope. A low shrub. Flowers white."

The following appears to be a variety of this species differing from type in the deeply lobed leaves and fewer flowers in the inflorescence:—

Near Mulema. Fl. May, 304.

Native name "Makokwa." "Woody stems used in hut-building. Shrubby, 10 ft. high."

Distrib. Nile Land — Central African Lake-Region, Mozambique District.

DOMBEYA PEDUNCULATA, *K. Schum. in Engl. Pflanzenwelt Ost-Afr.* C. 269.

Ruchigga. Fl. November, 451.

Shrub with pink flowers.

Distrib. Central African Lake-Region.

D. (§ Eudombeya) BAGSHAWEI, sp. nov.

Frutex ramis validis lignosis brunneo-corticatis, lenticellosis præcipue sursum ± brunneo-tomentosis; foliis modice petiolatis, petiolo manifeste rufo-tomentoso, latissime suborbicularibus, 3- vel sub 5-lobatis, lobis rotundatis, latioribus quam longis utrinque dense tomentosis subtus pallidioribus margine irregulariter denticulatis palmatim 8–9 nerviis; inflorescentia pedunculata furcata, pedunculo ramulisque rufo-tomentosis; floribus pro rata longiuscule pedicellatis, bracteolis caducis, ovatis vel oblongo-ovatis, subacuminatis; petalis valde obliquis inter mediocres generis; staminibus 15 cum staminodiis 5 ligulæformibus alternantibus, stamine medio triadum brevissimo, stylis cinereo- vel flavo-tomentosis, ovario pentamero, extus tomentoso.

Hab. Irunga. Fl. November, 1903. 391.

"Flowers white with red centres."

Folia 6·5–7 cm. longa, 11–12·5 cm. lata. Pedunculi 5·0–7·0 cm. longi, multiflori. Petala 12–13 mm. longa.

Following K. Schumann (Sterculiaceæ Africanæ, p. 20) this plant belongs to the first series in the Sect. *Eudombeya*, in which the peduncle bears more than three flowers.

D. (§ Xeropetalum) RETICULATA, *Masters, in Oliver, Fl. Trop. Afr.* i. 228.

Kagera Valley, near Mulema. Fl. April, 213.

Native name "Numkde." "Wood used for handles for tools. A shrub resembling an almond-tree in blossom; masses of flower; few leaves; flowers white, with faint pink tinge."

Hillside, Mulema. Fl. April, 261.

Native name "Mukde."

Distrib. Nile Land, Mozambique District.

WALTHERIA AMERICANA, *Linn. Sp. Pl.* 673.
Below Ruchigga. Fl. December, 497.
Distrib. Generally distributed throughout Tropical Africa.

TILIACEÆ.

GREWIA BICOLOR, *Juss. in Ann. Mus. Par.* iv. (1804) 90.
Mulema. Fl. April, 196.
Native name "Mukoma." "Wood used for sticks and handles of tools."
Island of Buvúma. Fl. March, 615.
Shrub with yellow flowers.
Distrib. Nile Land, Mozambique District.

G. SIMILIS, *K. Schum. in Engler, Jahrb.* xv. (1892) 118.
Near Mulema. Fl. April, 221.
Native name "Mukoma." "Shafts for spears. Shrub with blue flower."
Kagera Valley, near Mulema. Fl. May, 287.
Native name "Mukomakazi." "Posts used in hut-building. Shrub with white flowers."
No. 222 is probably a form of this species.
Distrib. Nile Land, Mozambique District.

G. MOLLIS, *Juss. in Ann. Mus.* iv. (1804) 91.
Island of Buvúma. Fl. August, 610.
Shrub with pink corolla and white sepals.
Distrib. Upper Guinea, Nile Land.

TRIUMFETTA PILOSA, *Roth, Nov. Sp.* 223.
Lake shore, Musozi. Fl. & Fr. December, 13.
Native name "Binsambwe." "Fibre used."
Distrib. Nile Land, Lower Guinea. Also in South Africa, India, &c.

T. RHOMBOIDEA, *Jacq. Enum. Pl. Carib.* 22.
Musozi. Fl. & Fr. December, 14.
Native name "Binsambwe."
Distrib. Widely distributed in the Tropics.

T. ANNUA, *Linn. Mant.* i. 73.
Ruchigga. Fl. November, 429.
Distrib. Nile Land, Lower Guinea.

GLYPHÆA GREWIOIDES, *Hook. fil. in Hook. Ic. Pl.* t. 760.
North of mouth of Bakora. Fl. & Fr. January, 136.

Native name "Muzira." "A shrub from which walking-sticks are cut."

Distrib. Upper and Lower Guinea.

LINEÆ.

HUGONIA PLATYSEPALA, *Welw. apud Oliver, Fl. Trop. Afr.* i. 272.

Lake shore, near mouth of Kagera. Fl. February, 563.

"Tree with yellow flowers."

A form with rather smaller flowers than type; outer sepals curved outwards at the margins, inner shortly apiculate.

Distrib. Upper Guinea, Lower Guinea.

MALPIGHIACEÆ.

FLABELLARIA PANICULATA, *Cav. Diss.* 436, t. 264.

Var. MOLLIS, *Engler, Pflanzenwelt Ost-Afr.* C. 232.

Musozi. Fl. & Fr. January, 83.

"A woody twiner. Fruit seen 40 ft. up."

Distrib. of variety. Central African Lake-Region.

GERANIACEÆ.

MONSONIA BIFLORA, *DC. Prod.* i. 638.

Hillside, near Mulema. Fl. May, 292.

"Prostrate herb with whitish-blue flowers."

Distrib. Nile Land, Lower Guinea; also Cape.

GERANIUM SIMENSE, *Hochst. ex A. Rich. Tent. Fl. Abyss.* i. 116.]

Ruchigga, alt. 7000–8000 ft. Fl. December, 469, 472, 528.

"Herb with blue or pink flowers."

Distrib. Nile Land, Mozambique District.

OXALIS CORNICULATA, *Linn.*; var. STRICTA, *Oliver, Fl. Trop. Afr.* i. 297.

Kagera Valley, near Mulema. Fl. May, 297.

Near River Rufúa. Fl. December, 512.

Distrib. A weed of cultivation in nearly all warm countries.

IMPATIENS BAGSHAWEI, sp. nov.

Caulis erectus herbaceus subsimplex vel sparse ramosus, internodiis inferioribus quam foliis 2–3-plo longioribus, superioribus brevioribus, ad nodos sæpe tentaculis glandulosis instructis; foliis breviuscule petiolatis, oppositis, lanceolatis vel ovato-lanceolatis, sæpissime 3–4-plo longioribus quam latis, ad apicem attenuatis, basi rotundatis vel leviter subcordatis, discoloribus, costa subtus distincta supra haud conspicua, pennatinerviis, nerviis lateralibus subtus prominulis erecto-patulis arcuatis, margine serratis; pedunculis strictis erectis vel erecto-patulis, tenuibus, glabris, quam folia brevioribus, paucifloris, axillaribus; floribus parviusculis, graciliter pedicellatis; sepalis lateralibus oblongo-ovatis obtusis quam petala brevioribus, labello infundibuliformi in calcar incurvatum et applanatum apice acutum abrupte exeunte, calcaribus quam flores longioribus; fructibus brevibus, inflatis, apice acutis inæquilateralibus, lineis paucis longitudinaliter notatis, glabris.

Hab. Near mouth of Kagera River. "Herb in swamps with pink flowers." Fl. & Fr. Feb. 1904. 552.

Caulis usque ad fere 70 cm. alt., internodiis inferioribus 5·0–9·0 cm. longis, superioribus 3·0–4·0 cm. longis. Folia 3·0–5·0 cm. longa, 1·0–1·2 cm. lata. Petiolus brevis 2·0–3·0 mm. longus.

This plant would fall in Series A of Dr. Warburg's Balsaminaceæ Africanæ (Engler, Bot. Jahrb. xxii. 46) in the section of this series in which the inflorescence is more than 1-flowered.

RUTACEÆ.

TODDALIA NOBILIS, *Oliver, Fl. Trop. Afr.* i. 306.

Hillside, Mulema. Fl. April, 250.

Native name "Muzo." "Spears and walking-sticks made of this. A spreading shrub with yellow flowers and dotted leaves."

Musozi. Fl. January, 110. Native name "Nzo." "Tree-mallets made for hammering bark cloth."

Distrib. Nile Land. Mozambique District.

The following is probably another species of *Toddalia*, but fruit is required for determination:—

Ruchigga. Fl. November, 428. Island of Buvúma. Fl. March, 621.

"Shrub with dotted leaves and yellow greenish flowers."

ZANTHOXYLON NITENS, *Hiern, in Welw. Cat.* i. 112.

Island of Buvúma. Fr. March, 653.

"Thorny shrub with greenish-white flowers."

Only ♀ collected.

Distrib. Angola.

CLAUSENA ANISATA, *Hook. fil. in Niger Fl.* 256.

Hillside, Mulema. Fl. June, 355.

"Shrub with inconspicuous flowers and dotted leaves."

Distrib. of type. Nile Land, Mozambique District.

Var. MULTIJUGA, *Welw. ex Hiern. in Welw. Cat.* i. 116.

Irunga. Fl. November, 390.

"Shrub with whitish flowers and dotted leaves."

Distrib. Angola.

SIMARUBEÆ.

HARRISONIA ABYSSINICA, *Oliver, Fl. Trop. Afr.* i. 311.

Kagera Valley, near Mulema. Fl. May, 296.

Native name "Ente erungu." "Low shrub with greenish flowers."

Distrib. Nile Land, Mozambique district.

OCHNACEÆ.

OCHNA sp.

In forest at edge of swamp near Kanabulem. Fr. February, 170.

Native name "Mowa." "Used for posts in building. A shrub, flowers not seen."

BURSERACEÆ.

COMMIPHORA AFRICANA, *Engler, in DC. Mon. Phan.* iv. 14.

Kagera Valley, near Mulema. Fl. April, 214.

Native name "Mesesi." "Wood used for handles for tools. Low shrub. Flowers red."

Distrib. Nile Land.

CANARIUM SCHWEINFURTHII, *Engler, in. DC. Mon. Phan.* iv. 145.

Musozi. Fl. January, 111.

Native name "Mpafu." "Large tree with great spread of branches. Flower green. Fruit a drupe."

Distrib. Nile Land. Upper and Lower Guinea.

MELIACEÆ.

TURRÆA VOGELII, *Hook. fil. in Niger Fl.* 253.

Lake shore, Musozi. Fl. January, 75.

Native name "Makansi." "Used for posts and sticks. A low thin shrub; flowers white with white staminal tube; seeds black."

Distrib. Upper and Lower Guinea.

EKEBERGIA ? COMPLANATA, sp. nov.

Arbor ramulis fusco-pubescentibus; foliis longiuscule petiolatis, apice ramulorum dispositis, 6–7-jugis, foliolis oppositis, brevissime petiolulatis, obovato-oblongis vel oblongis, basi cuneatis, apice acute cuspidatis, utrinque ± pubescentibus, subtus pallidioribus, nerviis secundariis subpatulis adscendentibus; paniculis quam folia multoties brevioribus, pedunculatis, puberulis; calyce subcampanulato, subobtuse 5-dentato, extus puberulo; petalis 5, ovatis, extus pubescentibus; staminibus in tubum petalis paullo breviorem coalitis; antheris 10 in margine tubi sessilibus glabris ellipticis, disco brevi glabro annulari; ovario 4–5-loculari, stylo glabro ovario æquilongo, stigmate crasso, obconico 4–5-lobulato.

Hab. Island of Buvúma, Victoria Nyanza. Fl. March 1904. 600.

"Tree with white flowers."

Folia 22–32 cm. longa. Foliola 5·5–7·5 cm. longa, 2·2–2·7 cm. lata, nervo medio supra impresso. Pedunculus 13–17 cm. longus, inferne complanatus. Petala ± 4 mm. longa, 2 mm. lata.

Differs from *E. senegalensis*, A. Juss., by the leaflets being in 6–7 pairs and more or less pubescent above and below. Fruit is required.

E. SENEGALENSIS, *A. Juss.*, var. **CORIACEA**, *C. DC.*; floribus, 5-meris; calycis dentibus acutis; petalis 5, ovatis, pubescentibus, ± 3·5 mm. longis; tubo urceolato tomentoso, ± 2 mm. longo; antheris 10, ovario glabro 5-loculari; stylo glabro, stigmate capitato.

Hab. Kitara. In flower, August 9th, 1903. 378.

I have made the above notes, as this variety was described from fruiting specimens.

EKEBERGIA PETITIANA, *A. Rich.*, var. nov. AUSTRALIS; arbor cortice nigrescente, foliis imparipinnatis, foliolis sæpissime 7–9 lanceolatis, basi valde inæquilateris, glabris subtus haud glaucis; racemis folio multoties brevioribus; floribus 4- vel 5-meris, calycis dentibus semiovalibus; petalis oblongis obtusis; ovario 2-loculari.

Hab. Ruchigga. In flower December 1903. 466.

"Tree with white flowers."

Distrib. of the type. Abyssinia.

TRICHILIA EMETICA, *Vahl*, *Symb.* i. 31.

Coast of Victoria Nyanza. Fl. March, 576.

"Tree with pale yellow flowers."

Distrib. Widely distributed in Tropical Africa.

CHAILLETIACEÆ.

DICHAPETALUM BUVUMENSE, sp. nov.

Frutex cortice brunneo-lutescente, ramulis novellis puberulis, foliis chartaceis, adultis utrinque glabris, oblongis vel anguste obovato-oblongis, apice acutis, costa superne impressa, nervis lateralibus utrinque 7–8 arcuatim adscendentibus, prope marginem arcuatim connectis, venis reticulatis; petiolis brevibus, cinereo-pubescentibus; pedunculis subnullis cymas congestas ferentibus; sepalis oblongo-lanceolatis, pubescentibus, apice obtusis; petalis quam sepala 1½plo longioribus, longe cuneiformibus usque ad medium bilobis, lobis lineari-oblongis; staminibus quam petala longioribus, ovario ovoideo in stylum superne tenuem filiformem petala superantem contracto, stigmate breviter trifido.

Hab. Island of Buvúma, Victoria Nyanza. March 1904. 595.

Folia 9·0–12·0 cm. longa, 3·8–5·2 lata. Petiolus 2–3 mm. longus. Sepala ± 3 mm. longa. Petala angusta, 4·5 mm. longa. Stamina ± 6 mm. longa. Stylus ± 6·5 mm. longus.

Species *D. acutifolia*, Engler, affinis, differt pedunculis brevioribus, foliis longioribus, &c.

No. 650, also from the Island of Buvúma, may belong to this genus, but there are no flowers.

Dr. Bagshawe notes that the cut surface of the branches give out a smell as of sulphuretted hydrogen.

OLACINEÆ.

XIMENIA AMERICANA, *Linn. Sp. Pl.* 1193.

Island of Buvúma. Fl. & Fr. March, 666.

"Shrub with dark red flowers and bright red fruits."

Distrib. Widely distributed in Tropical Africa, also in Tropical America.

LEPTAULUS DAPHNOIDES, *Benth. in. Benth. & Hook. fil. Gen. Pl.* i. 351.

Island of Buvúma. Fl. March, 637.

"Shrub with white flowers."

Distrib. Upper Guinea.

APODYTES BENINENSE, *Hook. fil. in Hook. Ic. Pl.* t. 778.

Mouth of Kagera. Fl. February, 161. Coast of Victoria Nyanza, Uganda, 582.

Native name "Kafumbo." "A liane; from the bark are made lines for fishing. Flowers white."

Distrib. Upper Guinea and Lower Guinea.

CELASTRACEÆ.

GYMNOSPORIA SENEGALENSIS, *Loes.*

Var. INERMIS, *Rich.*, forma CORIACEA, *Loes. in Engler, Jahrb.* xvii. (1893) 541.

Near Mulema. Fl. April, 211.

"Shrub with white flowers."

Var. INERMIS, forma MACROCARPA, *Loes. l. c.* 542.

Near Mulema. Fl. April, 256.

Native name "Munyaburuk." "Handles made for hatchets. Shrub with white flowers."

Var. SPINOSA, *Engler, Jahrb.* xvii. (1893) 542.

In gully near Mulema. Fl. May, 293.

Native name "Omwah." "Spoons made from the wood. Shrub with white flowers."

Distrib. Widely distributed in Tropical Africa; Mediterranean Region and eastward to India.

G. FASCICULATA, *Loes. in Engler, Jahrb.* xix. (1893) 232.

Lake shore, Musozi. Fl. February, 162.

Native name "Mpoko." "Walking-sticks cut. A large shrub; flowers greenish."

Near Mulema. Fl. May, 263.

Distrib. Mozambique District. Also in the Comoro Islands.

ELÆODENDRON ÆTHIOPICUM, *Oliver, in Fl. Trop. Afr.* i. 365.

Irunga. Fl. November, 385.

"Trees with greenish flower."

Distrib. Lower Guinea; Mozambique District.

RHAMNEÆ.

SCUTIA INDICA, *Brongn.*, var. OBLONGIFOLIA, *Engler, in Jahrb.* xix. (1904) *Beibl.* no. 47. 37.

Near Mulema. May, 303.

Native name "Mugusha." "Shrub. Fruit eaten."

Distrib. Kilimanjaro District.

HELINUS MYSTACINUS, *E. Meyer, ex Steud. Nom.* ed. II. 1. 742.

Ruchigga. Fl. November, 453.

"Climbing shrub with greenish-white flowers."

Gorge near Mulema. Fl. April, 262.

Native name "Muvimba." "Given to cows to produce milk."

Distrib. Nile Land, Mozambique District.

AMPELIDEÆ.

CISSUS ARGUTA, *Hook. fil. in Niger Fl.* 261.

Musozi. December, 65.

Distrib. Upper Guinea.

C. QUADRANGULARIS, *Linn. Mant.* i. 39.

Near Mulema. Fl. April, 193.

Native name "Kagenzanda." "Climber; flowers reddish."

Distrib. Widely distributed in Tropical Africa. Also Arabia, Comoro Is., Madagascar, &c.

C. ADENOCAULIS, *Steud. ex A. Rich. Tent. Fl. Abyss.* i. 111.

Near Mulema. May, 308.

Native name "Kibombo." "A climber: the fleshy root is used as an aperient."

Distrib. Nile Land, Mozambique District.

There are also two other species of *Cissus* insufficiently represented in the collection,—No. 151 gathered on the Lake shore, Musozi, Native name "Kikasakasa"; and No. 307 from near Mulema, Native name "Kibombo."

LEEA GUINEENSIS, *G. Don. Gen. Syst.* i. 712.
Island of Buvúma. Fl. March, 612.
Distrib. Tropical Africa and Islands.

SAPINDACEÆ.

CARDIOSPERMUM GRANDIFLORUM, *Swartz*, var. ELEGANS, *Hiern, in Welw. Cat.* Part i. 166.
Island of Buvúma. Fl. March, 618.
"Liane with pinkish-white flowers."
Distrib. Lower Guinea.

PAULLINIA PINNATA, *Linn. Sp. Pl.* 366.
Musozi. Fl. January, 115.
Native name "Kabugu." "Climber used to make baskets."
Hillside, Musozi. Fr. January, 118.
Distrib. Widely distributed in Tropical Africa; also in Madagascar and Tropical America.

ALLOPHYLLUS AFRICANUS, *Beauv. Fl. Owar.* ii. 54, t. 107.
Lake shore, Musozi. Fl. January, 77.
Distrib. Upper Guinea.

A. SUBCORIACEUS, sp. nov.

Frutex foliis parviusculis, breviuscule petiolatis, petiolo demum glabro, foliolis lateralibus quam terminalibus paullo brevioribus, subcoriaceis, oblongis, basin versus angustatis, omnibus subsessilibus, margine integris vel hinc inde serratis, utrinque glabris, nervis venisque utrinque subtus prominentibus; inflorescentia nunc simplice pseudo-racemosa, nunc ramos utrinque emittente sæpissime folium subduplo superante; floribus generis, albis parvulis, in cymulas approximatas dispositis, rhachi pedicellisque pilosulis.

Hab. Near Mulema. Fl. May 1903. 264.

Native name "Mtete." "Sticks rubbed together and used to produce fire. A spreading shrub with white flowers."

Foliola 3·5–5·5 cm. longa, 1·5–2·1 cm. lata. Petiolus communis, 8–13 mm. longus.

Not closely allied to any species of which I have seen specimens. Noticeable on account of the rather small, subcoriaceous leaflets and small numerous flowers in few-flowered cymules.

ALLOPHYLLUS LATEFOLIOLATUS, sp. nov.

Frutex ramulis pubescentibus, foliis mediocriter petiolatis, petiolo pubescente, foliolis late ovatis, lateralibus oblique oblongo-ovatis, intermedio basin rotundato vel latissime cuneato, apice acuminato, lateralibus basi oblique subcordatis vel rotundatis, circiter 1½plo longioribus quam latis, omnibus papyraceis, margine grosse serratis, utrinque glabratis, nervis pilosulis, nervis venisque utrinque subæqualiter prominentibus; inflorescentia pseudo-racemosa, paullo folium superante; floribus generis, brevipedicellatis in cymulas inferne remotas dispositis, rhachi pedicellis calycibusque pilosiusculis.

Species *A. Welwitschii*, Gilg, affinis, sed floribus majoribus.

Hab. Lake shore, Musozi. February 4th, 1903. 153.

Native name "Kakoto." "Shrub, fish-baskets made. Flowers white."

Foliola 6·0–10·0 cm. longa, 4–6·5 cm. lata. Petiolus communis, 2·5–4·0 cm. longus.

A. PSEUDO-PANICULATUS, sp. nov.

Frutex foliis mediocriter petiolatis, petiolo patenti rufo-hirsuto, trifoliolatis, foliolis oblongis vel oblongo-obovatis, intermedio basin versus sensim longe cuneato-angustato apice acuminato, lateralibus quam terminalibus paullo brevioribus, basi oblique subrotundatis, omnibus papyraceis, præcipue in parte superiore argute serratis, utrinque ± pilosulis, nervis venisque subtus prominentibus; inflorescentia copiose ramosa pseudo-paniculata folium superante; floribus generis, numerosis in cymulas dispositis, rhachi rufo-tomentosa, pedicellis calycibusque glabris.

Hab. Hill near R. Rufúa. Jannary 1904. 544.

"Shrub with white flowers only. ♂ only.

"Minute petals covered with white hairs; disc orange-red, 4-lobed."

Foliola 6·0–9·0 cm. longa, 3·0–3·8 cm. lata. Petiolus communis, 4·0–5·0 cm. longus.

Differs from *A. stachyanthus*, Gilg, especially in the apex of the leaflets.

DEINBOLLIA FULVO-TOMENTELLA, sp. nov.

Arbor 10-pedalis, foliis magnis circ. 7-jugis, foliolis amplis oppositis vel suboppositis coriaceis, petiolulo crasso brevi tenuiter puberulo, oblongis, penninerviis, nerviis lateralibus utrinque sæpissime 11–13, prope marginem arcuatis et inter se conjunctis, supra impressis, fere glabris, subtus reticulatis et pubescentibus ad apicem attenuatis apice ipso obtusis, basi rotundatis, paniculæ ramulis præcipue inferne ± elongatis, tenuiter fulvo-tomentellis; floribus masculis albis; sepalis concavis imbricatis, dorso rufo-pubescentibus margine subscariosis; petalis unguiculatis, ovatis ± albo-hirtis, ad basin squamula magna tomentosa instructis; staminibus circa 18–20, petalis subæquilongis, filamentis pubescentibus, disco manifeste conspicuo.

Species *D. insigni*, Hook. fil., valde affinis.

Hab. Island of Wema, Victoria Nyanza. Fl. March 1904, ♂ only. 592.

Folia 50–60 cm. longa. Foliola 16–24·5 cm. longa, 7–9 cm. lata. Sepala 4–5 mm. longa. Petala ± 6 mm. longa ± 4 mm. lata. Filamenta ± 5 mm. longa.

PAPPEA UGANDENSIS, sp. nov.

Frutex ramis vetustioribus nigrescenti-corticatis, foliis apicem ramulorum versus confertis, oblongis, apice obtusis, basi rotundatis, nervis lateralibus utrinque 10–17 subtus prominentibus, modice petiolatis, junioribus utrinque brevissime tomentosis, adultioribus supra demum glabratis; inflorescentia axillari, spicato-racemosa; calyce cupulari 5-lobato, in flore ♂ staminibus 8, exsertis, ovario rudimentario, in flore ♀ ovario 3-lobo, 3-loculari hirsuto, disco annulari hypogyno, stylo brevi crasso erecto superne longitudinaliter tristigmatoso.

Species *P. capensi*, Ecklon & Zeyher, affinis, differt floribus brevissime pedicellatis, racemis fœmineis quam racemis masculis longioribus, filamentis longioribus.

Hab. Hillside, Mulema. Fl. June 1903. 369.

"Shrub with inconspicuous flowers."

Folia 5·0–10 cm. longa, 2·3–4·5 cm. lata. Petiolus 6–10 mm. longus. Fl. ♂ filamentis ± 1·5 mm. longis sparse pilosulis. Fl. ♀ stylus ± 1·5 mm. longus.

DODONÆA VISCOSA, *Jacq. Enum. Pl. Carib.* 19.

Below Ruchigga, alt. 5,600 ft. Fl. December, 521.

Distrib. Widely distributed in the Tropics.

BERSAMA HOLSTII, *Gürke, in Engler, Jahrb.* xix. (1894) ***Beibl.*** n. 47. 36.

Hab. Kitara, Koki. August, 379.

" Tree with white flowers."

A plant with unopened flowers, presumably identical with the type which was collected by Holst in Usambara.

B. PAULLINIOIDES, *Baker, in Oliver, Fl. Trop. Afr.* i. 435.

Ruchigga. Fl. November, 398.

" Free with white flowers."

Distrib. Upper and Lower Guinea.

ANACARDIACEÆ.

ANAPHRENIUM PULCHERRIMUM, *Schweinf. Fl. Æthiop. Beitr.* i. 32.

Mulema. Fl. May, 306.

Native name " Mukerenge." " Tree with white flowers and white latex."

Distrib. Nile Land.

RHUS VILLOSA, *Linn.*, var. TOMENTOSA, *Oliver, Fl. Trop. Afr.* i. 439.

Hillside, Musozi. Fl. January, 123.

Native name " Kakansu."

Another form of this species was collected at Musozi. Fl. December, 50.

Native name " Msese." " Small branches used as a tooth stick."

Distrib. Widely spread in Tropical Africa.

R. GLAUCESCENS, *A. Rich. Tent. Fl. Abyss.* i. 143.

Near Mulema, Fl. May, 192.

Native name " Msese." " An infusion of the leaves is taken for pain in the abdomen. Shrub with green flowers."

Distrib. Nile Land, Mozambique District.

There is another species of *Rhus* in the collection from Irunga, 384, of which only ♀ fls. were obtained.

PSEUDOSPONDIAS MICROCARPA, *Engler, in DC. Mon. Phan.* iv. 258.

Mouth of Kagera. Fr. December, 71. Lake shore, Musozi. Fl. February, 163.

Native name " Nkoba." " Planks cut for canoes. Tree, flowers white. Wood contains resin."

Distrib. Upper and Lower Guinea.

LANNEA RUFESCENS, *Engler, Jahrb.* xxiv. 495.

Arbor ramulis floriferis dense rufescenti-tomentosis quam folia brevioribus; pedicellis brevissimis; calycis segmentis ovatis; petalis oblongo-ovatis, calyce triplo longioribus; staminum filamentis petala brevioribus (in floribus masculis); ovario rudimentario stylis coronato.

Hab. In gorge near Mulema. June 1903. 267. "Tree with reddish-green flowers, which come out before the leaves."

Inflorescentia 5–12·5 cm. longa. Petala ± 3 mm. longa. Antheræ 1·25 mm. longæ.

A description of the flowers is given, as Engler's specimens were sterile.

L. STUHLMANNI, *Engler, Pflanzenfam. Nachtr.* 214.

Kagera Valley, near Mulema. Fl. May, 286.

Native name "Mserot." "Wood used for posts in hut-building. Shrub with yellow flowers."

Distrib. Mozambique District.

L. FULVA, *Engler, Pflanzenfam. Nachtr.* 213.

Near Mulema. Fl. June, 347 & 354.

"Shrub with greenish or whitish flowers."

Distrib. Victoria Nyanza.

CONNARACEÆ.

AGELÆA NITIDA, *Solander, ex Planchon, in Linnæa*, xxiii. (1850) 437.

Island of Buvúma. Fl. March, 609.

Distrib. Upper Guinea.

A species of *Connarus* was obtained near the mouth of the River Kagera, 158, but without flowers.

LEGUMINOSÆ.

CROTALARIA ADENOCARPOIDES, *Taubert, in Engler, Pflanzenwelt Ost-Afr.* C. 206?

Hab. Ruchigga. November, 404.

"Shrubby plant; flowers brown and yellow."

Differs from the type in having a short raceme. Closely allied also to *C. argyrolobioides*, Baker, from the Nyika Plateau.

C. IMPERIALIS, *Taubert, in Engler, Pflanzenwelt Ost-Afr.* C. 206.

Hillside, Musozi. Fl. & Fr. December, 46.

Native name "Ksamba Ndega." "Shrub with flowers greenish-yellow."

Distrib. Central African Lake-Region.

CROTALARIA CEPHALOTES, *Steud. ex A. Rich. Tent. Fl. Abyss.* i. 156.

Near Mulema. April, 206.

Distrib. Upper and Lower Guinea, Nile Land.

C. LANCEOLATA, *E. Meyer, Comm. Pl. Afr. Austr.* 24.

Ruchigga, 7000 feet. Fl. November, 421.

"Erect plant, 8 ft. high, with yellow flowers."

Distrib. Nile Land, Mozambique District.

The following is another species of

CROTALARIA, but without pods.

Hillside, Mulema. Fl. April, 234.

Native name "Munyakishak." "Tubers eaten. Flowers yellow streaked with brown."

Hillside, Mulema. Fl. April, 253.

Native name "Katarugum." "Root eaten for toothache. Herb with yellow flowers striped with brown."

ADENOCARPUS MANNII, *Hook. fil. in Journ. Linn. Soc., Bot.* vii. (1864) 189.

Ruchigga. Fl. November, 424. "Shrub with conspicuous yellow flowers."

Distrib. Upper Guinea.

TRIFOLIUM POLYSTACHYUM, *Fresen. in Flora*, xxii. (1839) 50.

River Rufúa, alt. 4400 ft. Fl. December, 536.

Herb in marshy ground with pink flowers.

Distrib. Nile Land, Lower Guinea, Mozambique District.

T. SUBROTUNDUM, *Hochst. et Steud. in Flora*, xxiv. (1841) i. *Intell.* 32; *A. Rich. Tent. Fl. Abyss.* i. 172.

River Rufúa. Fl. December, 508.

"Herb with pink flowers in 6 in. water."

The following are also allied to this species:—

On a hill near Rufúa. Fl. January, 550. With calyx-tube ± 3 mm. long, teeth 5 mm. Standard oblanceolate, 7–8 mm. long.

Ruchigga, alt. 7000 feet. Fl. November, 413. Herb with red flowers with 10-ribbed calyx and linear setaceous teeth.

Distrib. Nile Land, Upper and Lower Guinea.

INDIGOFERA (§ Acanthonotus) DREPANOCARPA, *Taubert, in Engl. Pflanzenwelt Ost-Afr.* C. 209.

Lake shore, Musozi. Fl. & Fr. December, 18.

"Shrubby, prostrate; flowers red."

Distrib. Central African Lake-Region.

INDIGOFERÆ (§ Tinctoriæ) sp.

I. macrophyllæ, Schum. & Thonn., affinis, differt ambitu foliolorum, vexillo juvenili extus fulvo-tomentello, foliolis sæpissime 11–13 etc., et ab *I. emarginella*, Steud., differt racemis longioribus etc.

Hab. Ruchigga. Fl. November 1903. 443.

"Shrub with dark orange flowers."

INDIGOFERA BAGSHAWEI, sp. nov.

Frutex erectus ramosus. Rami virgati erecti vel suberecti sursum ± albo-strigosi deorsum glabri, foliis in siccitate nigrescenti-cinereis imparipinnatis sæpissime 3-jugis cum impari, rarissime 2–1-jugis cum impari, foliolis oblanceolatis 3–4plo longioribus quam latis utrinque ± albo-strigosis, costa superne impressa subtus conspicua, apice acutis petiolulis brevissimis foliolis lateralibus oppositis; racemis nunc quam foliis brevoribus nunc paullo longioribus, pedunculis tenuibus albo-strigosis laxiuscule paucifloris, pedicellis tenuibus brevibus sæpissime quam calyce brevioribus, calyce extus albo-strigoso, calycis lobis anguste lanceolatis acutis tubo subæquilongis, floribus rubris (ex collect.) in speciminibus mihi obviis delapsis, legumine juvenili cinereo recto etoruloso lateraliter subcompresso extus albo-strigoso paucispermo stigmate coronato.

I. heterocarpæ, Welw., affinis.

Hab. Musozi. Shrubby plant. Sand by Lake. Flowers red. Fl. December, 11.

Folia 1·0–1·3 cm. longa. Foliola 8–11 mm. longa, 2–3 mm. lata. Pedunculi 1·0–2·0 cm. longi, pedicelli sæpe vix 1 mm. longi. Calycis tubus ± 1·5 mm. longi. Legumen juvenile 3–6 mm. longum.

The difference between this and *I. heterocarpa* is very marked in the dried state, the former being silvery-black, the latter remaining green; the former also branches some distance from the base, the latter from the base.

INDIGOFERA HIRSUTA, *Linn.*, var. POLYSTACHYA, *Welw. ex Baker, in Oliver, Fl. Trop. Afr.* ii. 89.

Ruchigga, alt. 7200 ft. Fl. December, 523.

Shrub with dark red flowers.

Distrib. Angola.

TEPHROSIA VOGELII, *Hook. fil. in Niger Flora*, 296.

Hillside, Musozi. Fl. & Fr. December, 41.

Distrib. Upper and Lower Guinea, Nile Land, and Mozambique District.

T. NYASÆ, *Baker fil.*, *in Trans. Linn. Soc.* ser. II. *Bot.* iv. (1895) 9.

Irunga. Fl. November, 389. Ruchigga, alt. 6000–7000 ft. Fl. November, 426.

"Shrub with bluish flowers."

Distrib. Nyasa-land.

T. PANICULATA, *Welw. ex Baker, in Oliver, Fl. Trop. Afr.* ii. 122.

Mouth of Kagera. Fl. December, 26. Ruchigga. Fl. November, 442.

"Shrub with orange-coloured flowers."

Distrib. Angola.

SESBANIA ÆGYPTIACA, *Poir. Encycl. Méth.* vii. 128.

Below Ruchigga, alt. 6000 ft. Fl. December, 491.

"Trees with yellow flowers and dusky standards."

Distrib. Upper Guinea, Nile Land.

Extends through Tropical Asia to North Australia.

S. ACULEATA, *Poir. Encycl. Méth.* vii. 128.

Near Mulema. Fl. May, 294.

Native name "Munyegenyege." "Yellow flowers."

Distrib. Upper Guinea, Mozambique District; also Natal and through Tropical Asia to Australia.

DIPHACA TRICHOCARPA, *Taubert, in Engler, Pflanzenwelt Ost-Afr.* C. 213.

Near River Kagera, Mulema. Fl. April, 198.

Native name "Muwendobisa." "Kraals for cattle are made of this."

Distrib. Central African Lake-Region.

ÆSCHYNOMENE SCHIMPERI, *Hochst. ex A. Rich. Tent. Fl. Abyss.* i. 202.

Mouth of Kagera. Fl. & Fr. December, 24.

Distrib. Nile Land.

Æ. INDICA, *Linn. Sp. Pl.* 713.

In swamp, River Rufúa. Fl. December, 507.

Distrib. Widely spread in Tropical Africa.

SMITHIA KOTSCHYI, *Benth. in Miq. Pl. Jungh.* 211.

Musozi. Fl. February, 149. Ruchigga. Fl. November, 403.

"Shrub with glandular hairs and yellow flowers."

Distrib. Nile Land.

S. ÆSCHYNOMENOIDES, *Welw. ex Baker, in Oliver, Fl. Trop. Afr.* ii. 153.

Ruchigga. Fl. November, 395.

"Shrub with white flowers with faint blue stripes."

Distrib. Angola.

ZORNIA DIPHYLLA, *Pers. Syn.* ii. 318.

Hillside, Mulema. Fl. April, 236. Near River Rufúa. Fl. December, 505.

Distrib. Widely distributed in the Tropics.

DESMODIUM SCALPE, *DC. Prod.* ii. 334.

Ruchigga. Fl. December, 478.

Distrib. Widely distributed in Tropical Africa. Also Natal, Mascarene Islands, East Indies, and Malaya.

PYCNOSPORA HEDYSARIOIDES, *R. Br. ex Wight & Arn. Prod.* 197.

Hillside, Mulema. Fl. April, 233.

Native name "Kazuganji." "Used for cough."

Distrib. Widely spread in Tropical Asia. Australia.

PSEUDARTHRIA HOOKERI, *Wight & Arn. Prod. Fl. Ind.* 209.

Musozi. Fl. & Fr. February, 148.

Distrib. Nile Land, Lower Guinea, Mozambique District; also Natal.

VICIA SATIVA, *Linn.*, var. ABYSSINICA, *Baker, in Oliver, Fl. Trop. Afr.* ii. 172.

Ruchigga, alt. 7500 ft. Fl. December, 471.

"Herb with bluish-pink flowers."

Distrib. Nile Land.

ABRUS PRECATORIUS, *Linn. Syst.* ed. XII. 472.
Hillside, Mulema. Fl. June, 370.
Distrib. Widely distributed throughout the Tropics.

A. PULCHELLUS, *Wall. ex Thw. Enum. Pl. Zeyl.* 91.
Island of Buvúma. Fr. March, 652.
Distrib. Nile Land, Upper Guinea, Central African Lake-Region. Also in Tropical Asia.

ERYTHRINA TOMENTOSA, *R. Br. in Salt, Abyss. App.* 62.
Ruchigga, alt. 7200 ft. Fl. December, 531.
"Tree 25 ft., with scarlet flowers."
Distrib. Nile Land, Mozambique District.

E. BAGSHAWEI, sp. nov.

Arbor vel frutex, ramis cinereo- vel albido-corticatis, spinis brevibus nigrescentibus; foliolis 3 ovato-lanceolatis vel suborbicularibus, basi rotundatis, apice acutis, margine integris haud lobatis, nervis lateralibus erecto-patulis, utrinque 8–10, modice petiolulatis, præter nervos glabriusculis; racemis axillaribus; floribus coccineis, pedunculis fusco-tomentellis; calyce spathaceo, subcoriaceo, glabriusculo, laciniis brevibus; vexillo alis longiori, subsessili, cæteras partes floris amplectente; alis inæquilateraliter oblongis, brevissime unguiculatis, glabris; ovario stipitato pluriovulato; stylo incurvo; leguminibus basi in stipitem attenuatis, plurispermis, valvis extus coriaceis molliter et breviter tomentosis.

Species *E. Brucei*, Schweinf., affinis, differt racemis floribus paucioribus, pedunculis fusco-tomentellis non lanato-tomentosis.

Hab. Sandy soil north of mouth of River Bakora. January 1903. 137.

Native name "Murungu." "Wood used for drums. A shrub or tree, circumference, 5 ft. from the ground, 8 ft.; thorns on trunk; flowers red, very few leaves."

Foliola 7·0–11·5 cm. longa, 4·5–6·7 cm. lata. Calyx ± 2·5 cm. longus. Vexillum externe glabrum ± 2·7–2·8 cm. longum, subsessile. Alæ ± 1 cm. longæ. Carina vexillo multo minor suborbicularis 6–7 mm. longa.

PHASEOLUS SCHIMPERI, *Taubert, in Engler, Hochgebirgsfl.* 267.
Hillside, Mulema. Fl. April, 235.
"Trailing plant with purple flowers and large woody rhizome."
Distrib. Nile Land.

VIGNA FRAGRANS, sp. nov.

Caulis subvolubilis striatus præcipue superne griseo-tomentosus, foliis mediocriter petiolatis, trifoliolatis, utrinque tomentosis, terminalibus trilobatis, lobo medio majore, apice obtusis mucronatis, basi late cuneatis, petiolulatis, foliolis lateralibus subsessilibus inæquilateraliter trilobatis, nerviis subtus prominentibus, stipulis persistentibus, lanceolatis striatis; pedunculis sparsissime pilosulis, apice 1-2-3-floris; floribus cæruleis; calyce campanulato, laciniis triangularibus, subacuminatis, hirtis, quam tubus brevioribus; vexillo extus glabro, suborbiculari, unguiculato calycem pluries excedente; alis oblique oblongo-subobovatis, basi auricula instructis; stylo arcuato, incurvo, infra apicem biseriatim barbato, stigmate laterali, ovali-globoso; leguminibus plurispermis, extra pilosulis, subtorulosis, calycem multoties excedentibus.

Species *V. trilobæ*, Walp. affinis, differt calyce breviore, etc.
Hab. Hillside, Mulema. Fl. April, 232.
Native name "Niahenge." "Seeds eaten. Trailing herb with large fibrous rhizome. Flowers blue and fragrant (keel petals white)."
Foliola terminalia 2·0–2·3 cm. longa, lateralia 1·5–1·8 cm. longa. Pedunculi 6·0–12·5 cm. longi. Calyx 5–6 mm. longus. Carina 17–18 mm. longa.

If the genus *Liebrechtsia*, De Wildem. (Fl. Katanga, 70), be maintained, it would include the above species. The differences in the style and stigma do not, however, seem sufficiently marked to warrant its separation from *Vigna*.

ERIOSEMA MONTANUM, *Baker fil., in Journ. Bot.* xxxiii. (1895) 142.
Ruchigga. Fl. December, 475.
"Shrub with yellow flowers, 4 ft. high."
Distrib. Nile Land, Mozambique District.

E. GLOMERATUM, *Hook. fil. in Niger Flora*, 313.
Musozi. Fl. & Fr. January, 73.
Distrib. Widely distributed in Tropical Africa.

RHYNCHOSIA CYANOSPERMA, *Benth. ex Baker, in Oliver, Fl. Trop. Afr.* ii. 218.

Island of Buvúma. Fl. March, 635.

'Twining shrub with wallflower-coloured petals."

Distrib. Mozambique District. Also Mascarene Islands and India.

R. RESINOSA, *Hochst. ex Baker, Fl. Trop. Afr.* ii. 218.

Near Mulema. Fl. March, 191.

Native name "Kashaka Kalibioya." "From the leaves a liniment is made. Low shrub with yellow-green flowers and glandular hairs."

Distrib. Nile Land.

DALBERGIA UGANDENSIS, sp. nov.

Frutex scandens, ramis plumbeo-corticatis lignosis, striatis, glabris, novellis nigrescenti-corticatis, foliolis subcoriaceis, sæpissime 8–12, alternis, oblongis, basi rotundatis, apice rotundatis vel leviter emarginatis, costa superne impressa, subtus conspicua, nervis lateralibus tenuibus numerosis, erecto-patulis, utrinque glabris, subtus pallidioribus, petiolis petiolulisque glabris, stipulis deciduis; floribus paniculatis, panicula axillari et terminali fulvo-tomentosa; calyce extus fulvo-tomentoso, segmentis ovatis quam tubo pluries brevioribus; petalis violaceis; vexillo carinam excedente, ovato-oblongo, unguiculato, carina obtusa naviculariformi, ungue gracili; alis quam carina longioribus; staminibus ut in congeneribus, antheribus parvis; ovario pilis albidis tecto; stylo gracili, stigmate parvo terminali; legumine ignoto.

D. saxatili, Hook. fil., affinis, differt panuliculis ± elongatis, pedicellis crassiusculis dense fulvo-tomentosis, calycis segmentis brevioribus.

Hab. Coast of Victoria Nyanza, Uganda.

"Liane with violet flowers." Fl. March, 587.

Petiolus communis 10–13 cm. longus, petiolulus 2–3 mm. longus. Foliola 2·5–4·4 cm. longa, 1·1–1·6 cm. lata. Calyx fere 5 mm. longus. Vexillum 7–8 mm. longum. Carina 6–6·5 mm. longa.

BAPHIA RADCLIFFEI, sp. nov.

Frutex ramis cinereo- vel flavescenti-corticatis, striatulis, glabrescentibus, teretibus; foliis modice petiolatis, petiolo

sæpissime nigrescenti, ambitu *B. barombiensis*, oblongis vel ovatis, apice subacuminatis, basi rotundatis vel late cuneatis, chartaceis, utrinque glabris, nervis lateralibus, utriusque 8–10 erecto-patulis, prope marginem inter se conjunctis, subtus prominulis, nervis nervulisque densiuscule reticulatis; racemis multifloris, demum laxis, pedunculis pedicellisque pubescentibus, bracteolis calyce multo minoribus; calyce membranaceo externe pubescenti; vexillo oblongo-ovato, breviter unguiculato, quam calyce vix longiore; ovario glabro, stylo curvato; legumine ignoto.

Species ex affinitate *B. polygalaceæ*, Baker, differt primo intuitu foliis angustioribus et præcipue petiolis brevioribus.

Hab. Lake shore, Musozi. Fl. January, 74.

Native name "Matchko." "Used for mallets to beat bark-cloth. A shrub with white flowers and conspicuous inflorescence."

Petiolus 1·0–1·5 cm. longus. Folia 8·0–10 cm. longa, 3·5–4·0 cm. lata. Vexillum 6–7 mm. longum.

PTEROLOBUM LACERANS, *R. Br. in Salt, Abyss. App.* 64.

Banks of Kagera River near Mulema. Fl. May, 269.

Native name "Orge." "Specimens in fruit sent subsequently."

Distrib. Abyssinia.

CASSIA DIDYMOBOTRYA, *Fres. in Flora,* xxii. (1839) 53.

Near Mulema. Fl. June, 366.

Distrib. Nile Land, Lower Guinea, Mozambique District.

C. FALCINELLA, *Oliver, in Fl. Trop. Afr.* ii. 281.

Near Mulema. Fl. March, 190.

Native name "Kanyeiira." "Wiry shrub, 12 inches high, with yellow flowers."

Distrib. Nile Land.

C. GRANTII, *Oliver, in Fl. Trop. Afr.* ii. 279.

Mulema. Fl. June, 360.

Wiry plant, 18 inches high, with yellow flowers.

Distrib. Mozambique District.

C. MIMOSOIDES, *Linn. Sp. Pl.* 379.

Mulema. Fl. June, 365.

Distrib. Common in the Tropics.

BAIKIAEA EMINII, *Taubert, in Engler, Pflanzenwelt Ost-Afr.* C. 198.

Lake shore, Musozi. Fl. January, 79.

Native name "Musa." "Used as a medicine for deafness; the leaves are heated, and the juice which exudes is squeezed into the ear. Tree 30–40 feet high."

Island of Buvúma. Fl. March, 607.

Shrub with white flowers."

Distrib. Central African Lake-Region.

PARKIA FILICOIDEA, *Welw. ex Baker, in Oliver, Fl. Trop. Afr.* ii. 324.

Island of Buvúma. Fl. March, 643.

"Tree with heads of red flowers."

Distrib. Upper and Lower Guinea, Mozambique District.

ENTADA ABYSSINICA, *Steud. in A. Rich. Tent. Fl. Abyss.* i. 234.

North of mouth of Bakora. Fr. January, 143.

Distrib. Nile Land, Lower Guinea.

PIPTADENIA AFRICANA, *Hook. fil. in Niger Flora*, 330.

Island of Buvúma. Fl. March, 647.

"Tree with brownish flowers."

Distrib. Upper and Lower Guinea.

DICHROSTACHYS NUTANS, *Benth. in Hook. Journ. Bot.* iv. (1842) 353.

Near Mulema. Fl. April, 255.

Native name "Muyebe." "Handles for hoes made. Tree with flowers yellow at distal, pink at proximal end."

Distrib. Widely distributed in Tropical Africa.

MIMOSA ASPERATA, *Linn. Syst.* ed. X. 1312.

Kagera Valley, near Mulema. Fl. May, 277.

Native name "Orge." "Shrub growing in marshy ground. Inflorescence pink."

Distrib. Widely spread through Tropical Africa.

ACACIA VEREK, *Guill. & Perr. Tent. Fl. Seneg.* i. 245, t. 56.

The following is either a form of the above or a close ally. The legumes are broader and generally fewer-seeded than those of *Acacia Verek* figured in Reliq. Kotsch. t. 3.

Hab. Hill-top, Mulema. May 1903. 266.

Native name "Mukonje." "Handles for hoes made. A tree with white flowers."

ACACIA PENNATA, *Willd. Sp. Pl.* iv. 1090.
Below Ruchigga. Fl. December, 498.
"Shrub climbing by thorns, white inflorescences."
Distrib. Widely distributed in Tropical Africa.

The following is allied, but has smaller pods:—
Bank of River Kagera, near Mulema. Fl. May, 289.
Native name "Mutinga." "Dug-out canoes made of this. Tree with white flowers and green stem."

A. SIEBERIANA, *DC. Prodr.* ii. 463, forma.
Near Kagera, Mulema. Fl. April, 216 & 258.
Native names "Mutiaza," "Mwezameno." "Dug-out canoes and planks made of this. Tree with white flowers."
Distrib. Widely distributed in Tropical Africa.

A. SEYAL, *Delile, Fl. Ægypt.* 216, tab. 52. f. 2.
Near Mulema. Fl. March, 188.
Native name "Nigandu." "Bark used as rope. Shrub. Inflorescence green."
Distrib. Widely distributed in Tropical Africa.

A. STENOCARPA, *Hochst. ex A. Rich. Tent. Fl. Abyss.* i. 238.
Hillside, Mulema. Fl. May, 317.
Native name "Musange." "Tree assuming an umbrella-shape; used in building huts. Inflorescence white."
Distrib. Nile Land.

The following is allied to *A. hebeclada*, DC.:—
Near Mulema. Fl. March, 189.
Native name "Mutongde." "Wood used for posts and handles of hoes; bark used as rope. A tree; flowers white."

ALBIZZIA VERSICOLOR, *Welw., in Oliver, Fl. Trop. Afr.* ii. 359.
Gully near Mulema. Fr. May, 301.
Native name "Mubula." "Vessels made to hold milk of this. Tree; no flowers."

A. BRACHYCALYX, *Oliver, Fl. Trop. Afr.* ii. 361.
Near Mulema. Fl. April, 219.
"Native name "Mumeya." Used for posts for houses and charcoal. A tree; flowers white; staminal tube red."
Distrib. Nile Land.

Albizzia Brownei, *Walp. Rep.* i. 928.
Island of Buvúma. Fl. March, 627.
"Tree with white petals and red staminal tube."
Distrib. Upper and Lower Guinea.

A. fastigiata, *Oliver, Fl. Trop. Afr.* ii. 361.
Hillside, Mulema. Fl. April, 207. Grunga. Fl. November, 383.
Native name "Munyanohinga." Wood used for handles for hoes and charcoal. A flat-topped tree with whitish flowers."
Distrib. Upper and Lower Guinea.
Also occurs in Natal.

Rosaceæ.

Parinarium curatellæfolium, *Planch. in Niger Flora*, 333; forma.
Near Mulema. Fl. April, 208.
Native name "Munabiliko." "Medicine for gonorrhœa made from the leaves. A low tree. Petals light blue but fugitive."
Distrib. Upper Guinea, Nile Land, Mozambique District.

Rubus apetalus, *Poir. Encycl. Méth.* vi. 242.
Ruchigga. Fl. November, 422.
"Climber. Flower with pink stigmas, green perianth."
No. 520, from the same locality, is also a species of *Rubus*.
Distrib. Nile Land, Mozambique District.

Crassulaceæ.

Kalanchoe crenata, *Haw. Syn.* 109.
Musozi. Fl. January, 116.
Distrib. Widely spread in Tropical Africa; also at the Cape.

K. Stuhlmanni, *Engler, in Pflanzenwelt Ost-Afr.* C. 188; var. ?
Near Kikobe ferry, River Kagera. Fl. March, 180.
Native name "Kyondo." "Planted by natives amongst the bananas. White flower."

Succulent herb. This differs in certain respects from Engler's description, but I have not had an opportunity of comparing it with authentic material.

Distrib. Central African Lake-Region.

COMBRETACEÆ.

COMBRETUM SPLENDENS, *Engler*, *Pflanzenwelt Ost-Afr.* C. 289 (1895).

Near Mulema. Fl. April, 212.

"Shrub with small white flowers."

The following is closely allied:—

Bank of River Kagera, near Mulema. Fl. May, 290.

Native name "Muramma." Tree with greenish flowers.

Distrib. Central African Lake-Region, Mozambique District.

C. BUVUMENSE, sp. nov.

Frutex ramis adultioribus glabris, novellis ± fusco-pubescentibus, foliorum petiolo superne canaliculato, lamina membranacea, ovata acuminata, superne glabra vel glabriuscula, basi late cuneata vel rotundata, nervis lateralibus patulis adscendentibus; racemis axillaribus, copiose floriferis, abbreviatis; floribus inter mediocres generis breviter pedicellatis, 5-meris, receptaculo inferiore tenuiter fusco-pubescente, superiore cylindrico-campaniforme, medio haud constricto; calycis segmentis æquilateraliter triangularibus, acuminatis; petalis oblongo-ovatis, basi cordatis, margine ciliatis, longioribus quam latis, basi cordatis.

Species ad *C. paniculatam*, Vent., accedens.

Island of Buvúma, Victoria Nyanza. Fl. March 1904. 624.

A member of Engler & Diels's Section *Conniventes.*

Folia ad 7·5 cm. longa an longiora. Petiolus sæpe 7–8 mm. longus. Racemi 1·5–2·0 cm. longi. Receptaculum superius ± 6·5 mm. longum.

Petala ± 3 mm. longa. Stamina quam petala 3–4plo longiora.

ILLIGERA PENTAPHYLLA, *Welw. in Trans. Linn. Soc.* xxvii. (1869) 26.

Island of Buvúma. Fl. March. 601. "Liane with pink petals and orange pollen." 619. "Liane with greenish flowers."

Distrib. Lower Guinea.

MYRTACEÆ.

EUGENIA GUINEENSIS, *Hiern, Welw. Cat.* i. 359.
Island of Buvúma. Fl. March, 614.
"Tree with white flowers; colour due to stamens."
Distrib. Upper and Lower Guinea.

E. CORDATUM, *M. A. Laws. in Oliver, Fl. Trop. Afr.* ii. 438.
Musozi. Fl. & Fr. December, 5.
Native name "Kirungi nsamvu." "Burnt to give a pleasant smell to bark-cloth."
Distrib. Lower Guinea, Mozambique District; also Natal.

There is another specimen of *Eugenia* in the collection from Musozi, 154. Native name "Ntukuza," evidently allied to *E. bukobensis*, Engler, but the material is insufficient for identification.

MELASTOMACEÆ.

DISSOTIS MINOR, *Gilg, Mon. Afric. Melastom.* 12, t. 2 c.
Musozi. Fl. January, 86.
"Low shrub with a red flower."
Distrib. Uganda.

D. IRVINGIANA, *Hook. fil. in Bot. Mag.* t. 5149.
In gully above Mulema. Fl. May, 310. Ruchigga. Fl. December, 480.
Native name "Nkurutetabi." "Erect herb 2–2½ ft. Flowers blue or purple."
Distrib. Upper Guinea.

MEMECYLON HETEROPHYLLUM, *Gilg, Mon. Melastom.* 39.
Island of Buvúma. Fl. March, 608.
"Shrub with blue flowers."
Distrib. Central African Lake-Region.

LYTHRACEÆ.

ROTALA BREVISTYLA, sp. nov.

Planta natans caulibus crassicusculis simplicibus, inferne sæpe radicantibus, glabriusculis, præcipue extremitates versus foliosis, foliis internodiis subæquilongis, e basi cordatis ovatis vel oblongo-ovatis, sessilibus, oppositis, glabris, obscure penninerviis, apice obtusis; floribus minimis axillaribus, subsessilibus, foliis floralibus semper

multoties brevioribus, calyce demum campanulato, vix ad medium 4-lobato, lobis brevibus acutis quam tubo brevioribus; petalis minutis, anguste spathulatis; staminibus 2 inclusis, stylo brevi; capsulis globosis, 4-valvatis, demum quam calyce longioribus.

Hab. Mulema. "Floating plant; flowers minute, red." Fl. & Fr. May, 316.

Caules 15–20 cm. longi, internodiis 6–10 mm. longis. Folia 7–11 mm. longa, 5–7·5 mm. lata. Calycis lobi ± ·5 mm. longi. Capsula ± 1·5 mm. longa.

Allied to *R. fontinalis*, Hiern; differs from that species in the stem being longer and unbranched—in there being 2 stamens included instead of 4 exserted, &c.

AMMANNIA BACCIFERA, *Linn. Sp. Pl.* 120.
River Rufúa. Fl. December, 535.
"Erect herb in 2 in. of water; pink petals."
Distrib. Nile Land, Lower Guinea. Also in India and Madagascar.

ONAGRARIEÆ.

EPILOBIUM HIRSUTUM, *Linn. Sp. Pl.* 347.
In swamp near River Rufúa. Fl. December, 537.
Distrib. Widely spread in Africa and elsewhere.

JUSSIÆA LINIFOLIA, *Vahl, Eclog. Amer.* 32.
R. Rufúa. Fl. December, 538.
"Marsh plant 5 ft. high; yellow flowers."
Distrib. Widely distributed in Tropical Africa. Also in Tropical America.

J. DIFFUSA, *Forsk. Fl. Ægypt.-Arab.* 210.
Poo. by Lake Musozi. December, 8. Water-plant.
Distrib. Upper Guinea, Nile Land, Mozambique District.

SAMYDACEÆ.

TRIMERIA MACROPHYLLA, sp. nov. (Pl. 1.)

Frutex inermis, ramis junioribus pubescentibus, foliis crassiusculis ovatis vel ovato-ellipticis, apice sæpissime acutis, rarissime obtusis, basi cordatis, margine serratis, subtus pilis albidis vestitis, adultioribus superne glabris, subpalmatinerviis; petiolis cinereo-pubescentibus, stipulis magnis deciduis; floribus albis dioicis, spicis masculinis simplicibus, quam folia multoties brevioribus sed quam petiolis longioribus; floribus in glomerulos aggregatis; ♂ brevissime pedunculatis, tetrameris vel pentameris, sepalis minutis lanceolatis, extus pilis obtectis; petalis sepalis subsimilibus paulo majoribus, in fl. tetramero; staminibus 12 inter glandulas 3-nis insertis, quam petalis longioribus; floribus ♀ capsulis coriaceis, stylis 3 gracilibus, stigmate parvo.

Species *T. tropicæ*, Burkill, valde affinis, differt foliis majoribus adultis superne glabris basi magis cordatis, filamentis paullo longioribus.

Hab. Near Mulema. Fl. & Fr. June, 346.

"Shrub with whitish inflorescence."

Folia 7·0–12·5 cm. longa, 5·5–9·50 cm. lata. Petiolus 1·0–1·5 cm. longus. Spicæ masculini 4·5–8·5 cm. longæ. Capsula 3–3·5 mm. longa.

TURNERACEÆ.

WORMSKIOLDIA PILOSA, *Schweinf.*, var. α **ANGUSTIFOLIA**, *Urban, Mon. Turner.* 54.

Island of Wema. Fl. March, 590.

Herb with orange-yellow flowers.

Distrib. of type. Upper Guinea.

PASSIFLOREÆ.

BARTERIA ACUMINATA, sp. nov.

Arbor humilis vel frutex ramulis striatis tenuiter rufescenti-puberulis, an demum glabrescentibus; foliis oblongis vel oblongo-ellipticis, coriaceis, fere glabris, apice acuminatis, basi in petiolo attenuatis, petiolo brevissimo, crasso, non stipulato, decurrente, lamina nerviis supra et infra circ. 16–19 ante marginem inter se arcuatim conjunctis, nervatione reticulata subtus prominula; floribus 1–2 axillaribus sessilibus, basi bracteatis, bracteis numerosis arcte imbricatis cupuliformibus, brunneis, nitidis, margine ciliatis; sepalis 5 ovato-oblongis, acuminatis, quam petalis longioribus, basi coalitis; petalis albis oblongis, apice mucronatis; staminibus numerosis; stigmate maximo conico-globoso flavo; fructu globoso.

Species *Barteriæ nigritanæ,* Hook. fil., affinis, differt foliis apice sensim acuminatis.

Hab. Lake shore, Musozi. Fl. January. 93.

"Shrub or tree. Flowers white, with large yellow stigma. Leaves two-ranked."

Folia 22–24 cm. longa, 6·0–7·0 cm. lata. Petiolus ± 6·0–8·0 mm. longus, supra canaliculatus. Sepala 2·8–3·0 cm. longa, 10–11 mm. lata. Antheræ ± 3 mm. longæ.

ADENIA VENENATA, *Forsk. Fl. Ægypt.-Arab.* 77.

Mulema, close to a hut. Fl. April, 239.

Native name "Numanyama." "A shrub; flowers greenish; 2–3 ft. high only, but trunk 1 ft. diam. just above ground."

CUCURBITACEÆ.

MELOTHRIA PUNCTATA, *Cogn. in DC. Mon. Phan.* iii. 615.

Near Mulema. Fl. June, 361.

"Herbaceous twiner: ♂ only. White flowers."

Distrib. Widely spread in Tropical Asia.

BEGONIACEÆ.

BEGONIA EMINII, *Warb. in Engler & Prantl, Natürl. Pflanzenfam.* iii. 6 *a*, 141.

Lake shore, Musozi. Fl. December, 2.

The following is closely allied:—

In a wood near the mouth of Kagera. Fl. February, 564.

"Trailing plant with white flowers."

FICOIDEÆ.

MOLLUGO SPERGULA, *Linn. Syst.* ed. X. 881.

Island of Wema. Fl. March, 591.

"Prostrate herb with white flowers. Entire inflorescence in some cases red."

Distrib. Widely distributed in Tropical Africa.

UMBELLIFERÆ.

HETEROMORPHA ARBORESCENS, *Cham. & Schlecht. in Linnæa,* i. 385.

Near Mulema. Fl. June, 348.

"Shrub 10 ft. high, with inconspicuous flowers."

Distrib. Nile Land, Mozambique District.

PEUCEDANUM FRAXINIFOLIUM, *Hiern, in Oliver, Trans. Linn. Soc.* xxix. (1873) 79.
Near Mulema. June, 334.
"Shrub 18 ft. high, with fleshy stem."
Distrib. Nile Land, Lower Guinea.

TORILIS GRACILIS, *Engler, Pflanzenwelt Ost-Afr.* C. 301.
Ruchigga. Fl. November, 413.
"Herb with yellowish flowers."
Distrib. Mozambique District.

DICOTYLEDONES GAMOPETALÆ.

(By SPENCER MOORE, F.L.S.)

RUBIACEÆ.

HYMENODICTYON KURRIA, *Hochst. in Flora*, xxvi. (1843) 71.
In gulley above Mulema, also Ruchigga. Fl. December, Fr. May, 313 & 485.
Native name "Mwamira."
Distrib. Nile Land, Mozambique District, Upper and Lower Guinea.

NEUROCARPÆA LONGIFLORA, *S. Moore.* (Pentas longiflora, *Oliver, in Trans. Linn. Soc.* ser. II. *Bot.* ii. (1887) 335.)
Ruchigga. Fl. November, 406.
Distrib. Nile Land, Mozambique District.

N. THOMSONII, *S. Moore.* (Pentas Thomsonii, *S. Elliot, in Journ. Linn. Soc., Bot.* xxxii. (1896) 435.)
Ruchigga, 7500 ft. Fl. December, 473.
Distrib. Nile Land.

N. PURPUREA, *Hiern, Welw. Cat.* i. 438.
Gorge near Mulema. Fl. April, 247.
Distrib. Nile Land, Mozambique District, Lower Guinea.

OLDENLANDIA HERBACEA, *Roxb. Hort. Beng.* 11.
Hill-top near Mulema. Fl. & Fr. June, 338.
Widely distributed.

O. ABYSSINICA, *Hiern, in Oliver, Fl. Trop. Afr.* iii. 57.
Hill-top near Mulema. Fl. June, 336.
Distrib. African tropics except Lower Guinea and eastern part of Mozambique District.

MUSSÆNDA ARCUATA, *Poir. in Lam. Encyc.* iv. 392.

Musozi. Fl. June, 89.

Native name "Toke Kuru." "Used as medicine, leaves pounded with water and drunk for pains in abdomen."

Widely distributed: also a Mascarene species.

DICTYANDRA ARBORESCENS, *Welw. ex Benth. & Hook. f. Gen. Pl.* ii. 77.

Uganda, shore of Lake Victoria Nyanza at Mutunda. Fl. March, 578.

Distrib. Upper and Lower Guinea.

TARENNA AFFINIS, *S. Moore.* (Chomelia affinis, *K. Schum. in Engl. Pflanzenw. Ost-Afr.* C. 380.)

Musozi. Fl. January, 78.

"Shrub with showy white inflorescences." Native name "Omwanimwani."

Distrib. Mozambique District (Usambara).

RANDIA MACULATA, *DC. Prod.* iv. 388.

Island of Buvúma, Lake Victoria Nyanza. Fl. March, 630.

Distrib. Upper and Lower Guinea, North Central.

GARDENIA THUNBERGIA, *Linn. f. ex Thunb. Diss. Gard.* 11.

Hillside, Mulema. Fl. April, 227.

Native name "Ntalama." "Used for fences to keep away lions, &c."

Widely distributed.

G. URCELLIFORMIS, *Hiern, in Oliver, Fl. Trop. Afr.* iii. 104.

Uganda, shore of Lake Victoria Nyanza at Mbazi. Fl. March, 575.

Distrib. Nile Land (Niam-Niam).

The ripe fruits are globose, and two inches in diameter.

G. VISCIDISSIMA, sp. nov.

Arbuscula resiniflua aspectu *G. physophyllæ*, De Wildem. (*Randiæ physophyllæ*, K. Schum.), nisi omnimodo multo minor, foliis ovatis obtusissimis basi obtusis vel in petiolum brevem cuneatim angustatis integris tenuiter coriaceis costa centrali subtus puberula exempta et axillis costularum pubescentibus glabris, calyce parvo impariter 8-lobo lobis lanceolatis acutiusculis, floribus solitariis terminalibus, corolla mediocri crassiuscula superne gradatim amplificata fere adusque ¼ in lobos 5 ovatos

obtusissimos divisa, antheris angustis sursum curvatis, fructu ambitu oblongo subtereti coriaceo, seminibus in massam unicam confertis.

Hab. Edge of copse on hillside, Musozi. Fl. February, 144.

Folia 9·0–17·0 cm. long., 6·0–fere 12·0 cm. lat., nitida, subter castanea, supra fusca ibique resina copiosissime obducta. Stipulæ 0·5 cm. long. Pedunculus 0·7 cm. long., ut calyx resinosus. Flores lactei, suaveolentes. Calyx 0·8 cm., lobi circa 0·2 cm. long. Corollæ extus scabriusculæ 11·0 cm. long., tubus inferne 0·3–0·4 cm. diam., faucibus fere 3·0 cm.; lobi 0·25 cm. long. Antheræ paullo ultra 2·0 cm. long. Stylus breviter exsertus, sursum clavato-oblongus. Fructus 2·5 cm. diam., vix 4·5 cm. long.

Nervation of leaf exactly like that of *G. physophylla*, but the leaves, besides being much smaller, are very obtuse at the top. The calyx and corolla are also very much smaller than those of the species just cited. The 8-lobed calyx and longer anthers may be mentioned among other points of difference.

Native name "Mugondo." "Wood used for posts."

OXYANTHUS LITOREUS, sp. nov.

O. alte fruticosus ramis validis saltem prope nodos applanatis crasse pubescentibus, foliis magnis ellipticis obtusissimis basi valde obliquis necnon cordatis margine undulatis subcoriaceis in fac. sup. præsertim secus costam centralem scabridis subtus præsertim secus costam centralem et costulas hispidulo-pubescentibus, petiolis brevibus crassis hispidulo-pubescentibus, stipulis lanceolato-oblongis acutis extus hispidulo-pubescentibus, cymis plurifloris quam folia brevioribus, bracteis paucis parvis setaceis, floribus mediocribus pedicellatis, calycis limbo adusque $\frac{3}{4}$ diviso lobis subulato-setaceis piloso-hispidulis, corolla sat elongata verisimiliter hypocrateriformi laciniis angustis, ovario 2-loculari multiovulato albo-piloso.

Hab. Shore of Lake Victoria Nyanza at Musozi. Fl. January, 95.

Folia ex schedis cl. detectoris 40·0×25·0 cm. attingunt, ea mihi obvia 22·0 cm. long. et 12·0–14·0 cm. lat. metiuntur: petioli 1·0 cm. long. Stipulæ 2·0 cm. long. Pedicelli 0·2–0·5 cm. long. Bracteæ 0·1–0·25 cm. long. Cymæ 5·0 cm. deinde 8·0 cm. diam., griseo-puberulæ. Flores

virescentes. Calycis limbus 0·2 cm., lobi 0·6 cm. long. Corollæ nondum expansæ 10·0 cm., antheræ 0·65 cm. long. Stigma fusiforme, 0·65 cm. long., cruribus 0·1 cm. long. inclusis. Ovarium oblongum, 0·5 cm. long.

The material of this consists of two leaves with the part of the stem to which they are immediately attached, and two separated inflorescences—one with buds in various stages but no fully expanded flower, the other with very young fruits just after the corollas have fallen away. The length of the inflorescences cannot therefore be given, nor that of the flowers at maturity. In spite of this, I have ventured to describe the specimen, as it seems different from any hitherto known. In appearance it is much like *O. unilocularis*, Hiern, but the clothing of the leaf, the longer calyx-lobes, the 2-celled ovary, and, to judge from the unopened corollas, the smaller flowers are well-marked differential characters.

Oxyanthus lepidus, sp. nov.

O. fruticosus, glaber, ramulis aliquantulum tortis necnon applanatis olivaceis, foliis brevipetiolatis ovatis cuspidato-acutiusculis basi rotundatis chartaceis costis secundariis utrinque circa 10 summis parum aspectabilibus rectis sed marginem versus abrupte arcuatis, stipulis a basi lata in appendicem longam lineari-setaceam exeuntibus, corymbis abbreviatis paucifloris, bracteis lanceolatis acuminatis margine ciliolatis pedicellos æquantibus, calycis limbo ad ½ in lobos triangulari-subulatos diviso, corollæ tubo mediocriter elongato quam lobi lineares obtusi multo longiore extus glabro intus deorsum piloso sursum fauces versus transversim rugoso, filamentis perbrevibus, antheris anguste linearibus, ovario 2-loculari, stigmate anguste fusiformi.

Hab. Wema Island, Lake Victoria Nyanza. Fl. March, 594.

Folia 10–12 × 5–6·5 cm., supra subnitentia, in sicco olivacea, subtus pallida; petioli 0·5 cm. long., puberuli. Stipulæ extus puberulæ, intus basi pilosæ, pars expansa 0·3–0·4 cm., pars attenuata 0·7–1·0 cm. long. vel paullulum majus. Inflorescentiæ axis robustus, summum modo 0·5 cm. long. Bracteæ et pedicelli 0·3 cm. long. Calyx totus 0·4 cm. long. Corollæ albæ, tubus 8·0–8·5 cm. long.; lobi 1·5 cm. long., 0·3 cm. lat. Antheræ 0·4 cm., ovarium 0·25 cm. long. Stylus glaber, ad 1·2 cm. exsertus. Stigma 0·4 cm. long.

Known by the comparatively short leaves rounded below, together with the stipules terminating in a long slender appendage, the congested few-flowered inflorescences, the narrow lobes of the corolla, and the relative length to them of the tube.

TRICALYSIA BUXIFOLIA, *Hiern, in Fl. Trop. Afr.* iii. 119.
Near Mulema. Fl. & Fr. June, 352.
Distrib. Lower Guinea.

CANTHIUM SCHIMPERIANUM, *A. Rich. Tent. Fl. Abyss.* i. 350.
Kagera Valley, near Mulema. Fl. May, 282.
Native name "Mukiraga."
Distrib. Nile Land, Mozambique District (Usambara).

C. HISPIDUM, *Benth. in Hook. Niger Fl.* 409.
Mouth of River Kagera. Fl. December, 54.
Distrib. Nile Land, Mozambique District, Upper and Lower Guinea.

C. GOLUNGENSE, *Hiern, Welw. Cat.* i. 478; var. PARVIFLORA, var. nov. A typo discrepat ob flores plane minores. Calyx totus 0·15 cm. long., 0·12 cm. diam. Corollæ tubus 0·2 cm. long.; lobi tubo æquilongi. Stylus modo 0·65 cm. long.
Near Mulema. Fl. April, 209.
Native name "Mazaza."
Distrib. (of type). Lower Guinea.

C. LACTESCENS, *Hiern, Welw. Cat.* i. 511; var. GRANDIFOLIA, var. nov. Folia circa 15·0 cm. long. et lat.
Except for the great difference in size of leaf, I can see nothing to distinguish this variety from the type.
Near Mulema. Fl. June, 329.
Distrib. Lower Guinea.

VANGUERIA APICULATA, *K. Schum. in Engl. Pflanzenw. Ost-Afr.* C. 384.
In gully near Mulema, also Ruchigga. Fl. June & November, 350 & 464.
Distrib. Nile Land, Mozambique District.

CRATERISPERMUM BRACHYNEMATUM, *Hiern, in Oliver, Fl. Trop. Afr.* iii. 161.
Hillside, Musozi. Fl. February, 146.
Native name "Muschéra." "Used for posts in building."
Distrib. Upper Guinea.

C. SCHWEINFURTHII, *Hiern, in Oliver, Fl. Trop. Afr.* iii. 161.
Island of Buvúma, Lake Victoria Nyanza. Fl. March, 616.
Distrib. Mozambique District (Northern part), Central Lake District.

IXORA TERNIFOLIA, *Hook. f. ex Oliver, Fl. Trop. Afr.* iii. 177.
Ruchigga. Fl. November, 440.
Distrib. Central Lake District.

PAVETTA OLIVERIANA, *Hiern, in Oliver, Fl. Trop. Afr.* iii. 174.
Hill near the Rufúa. Fl. & Fr. January, 542.
Distrib. Central Lake District.

P. ASSIMILIS, *Sond. in Harv. & Sond. Fl. Cap.* iii. 20.
Kagera Valley near Mulema, and below Ruchigga. Fl. May, June, December; Fr. December. 285, 353, 487.
Distrib. South Africa.

P. GRUMOSA, sp. nov.

P. fruticosa, ramosa, ramis teretibus cinereis ramulos breves crebro foliosos griseo-pubescentes cito glabros et cinereos emittentibus, foliis parvis brevipetiolatis lanceolatis vel lanceolato-oblongis obtusis vel acutis sæpe cuspidulatis basi cuneatis glabris supra in sicco fuscis subtus olivaceis, stipulis amplis inter se connatis caducis sursum appendiculatis intus basi hirsutis, corymbis terminalibus perbrevibus densifloris griseo-pubescentibus, pedicellis quam calyx sæpissime brevioribus, floribus 4-meris, calycis pubescentis lobis lineari-subulatis acutis quam limbus liber longioribus, corollæ tubo elongato intus piloso-pubescente quam lobi anguste ovato-oblongi obtusi plane longiore, filamentis brevissimis ori affixis, antheris exsertis, stylo longo exserto glabro, stigmate leviter clavellato indiviso.

Hab. On ant-hill in swamp, River Rufúa. Fl. December, 511.

Folia 2·5–4·0 cm. long., 1·0–2·0 cm. lat.; costæ secundariæ utrinque circa 6 valde arcuatæ; costa media minute puberula; petioli 0·2–0·3 cm. long., supra griseo pubes-

centes. Stipularum pars basalis circa 0·2 cm. long., appendici filiformi recurvo-patenti æquilonga. Corymbi circa 5·0 cm. diam. Flores albi. Calycis limbus liber vix 0·1 cm., lobi 0·27 cm. long. Corollæ tubus 2·0 cm., lobi 0·6 cm. long. Filamenta 0·07 cm., antheræ lineares, torquatæ, 0·5 cm. long. Stylus 4·0 cm. long.

Recognized by the small leaves drying dark, coupled with the densely flowered corymbs and certain floral details.

PAVETTA BAGSHAWEI, sp. nov.

P. fruticosa, glabra, ramulis teretibus distanter foliosis, foliis brevipetiolatis obovatis vel anguste obovato-oblongis apice cuspidato-acuminatis basi obtusis vel rotundatis tenuiter coriaceis, stipulis in vaginam connatis sursum subulato-setaceis diuscule persistentibus, corymbis ad apicem ramulorum sessilibus densifloris, floribus 4-meris, calycis lobis sat elongatis subulato-setaceis ciliatis quam pars indivisa saltem 4-plo longioribus, corollæ mediocris tubo attenuato intus pubescente lobis oblongis obtusis 3-plo longioribus, antheris exsertis filamentis brevissimis fultis, stylo elongato longe exserto glabro, stigmate anguste fusiformi indiviso.

Hab. Shore of Lake Victoria Nyanza at Musozi. Fl. January, 127.

Folia summum 11·0 cm. × 6·5 cm., sæpius 10·0 × 3·5–4·5 cm.; costæ secundariæ utrinque circa 10, marginem versus aperte arcuatæ; costulæ haud prominentes; petioli ± 1·0 cm. long., crassiusculi. Corymbi adusque 5·0 cm. diam. Flores albo-virescentes. Calycis limbus 0·12 cm., lobi 0·5–0·6 cm. long. Corollæ tubus 1·5 cm. long., in sicco 0·1 cm. humectatus 0·2 cm. lat.; lobi 0·5 cm. long. Antheræ lineares, maxime torquatæ, 0·4 cm. long. Ovarium turbinatum, 0·15 cm., stylus 3·5 cm. long.

Known by the sessile densely-flowered inflorescences, together with the glabrous leaves, the relatively long setaceous ciliated calyx-lobes, and the medium-sized corollas with the tube three times as long as the limb.

RUTIDEA RUFIPILIS, *Hiern, in Oliver, Fl. Trop. Afr.* iii. 188.

Edge of swamp on shore of Lake Victoria Nyanza at Musozi. Fl. & Fr. February, 167.

Distrib. Central Lake District, Upper Guinea.

MYRSTIPHYLLUM CRISTATUM, *Hiern, Welw. Cat.* i. 493. (Psychotria cristata, *Hiern, in Fl. Trop. Afr.* iii. 205.)

Musozi and north of mouth of Bakore. Fl. & Fr. January, 90 & 141.

Distrib. Central Lake District, Lower Guinea.

GRUMILEA CATETENSIS, *Hiern, Welw. Cat.* i. 494.

Near shore of Lake Victoria Nyanza at Musozi. Fl. January, 120.

Distrib. Lower Guinea.

CHASALIA MACRODISCUS, *K. Schum. in Engl. Bot. Jahrb.* xxiii. (1896) 469.

Mouth of Kagera. Fl. & Fr. December, 70.

Identical with Welwitsch 3198, 3199, named by Hiern as above. Possibly a new species; the type of *Ch. macrodiscus* (Zenker 1262) being a laxer and smaller-flowered plant.

Distrib. Upper and Lower Guinea.

ANTHOSPERMUM LANCEOLATUM, *Thunb. Prod.* 32.

Irunga, November, 393.

Distrib. Nile Land, Mozambique District. Also South Africa.

TARDAVEL ANDONGENSIS, *Hiern. Welw. Cat.* i. 506.

Near Mulema. Fl. April, 218.

Distrib. Lower Guinea.

RUBIA CORDIFOLIA, *Linn. Syst.* ed. XII. 229.

Near Mulema. Fl. & Fr. June, 368.

Distrib. Nile Land, Mozambique District. Also in South Africa.

GALIUM STENOPHYLLUM, *Baker, in Kew Bull.* (1895) 68.

Irunga. Fl. & Fr. November, 394.

Distrib. Mozambique District.

COMPOSITÆ.

ERLANGEA (§ Platylepis) BAGSHAWEI, sp. nov.

E. caule ascendente sparsim folioso breviter griseo-tomentoso, foliis alternis petiolatis oblongo-lanceolatis utrinque acutis margine dupliciter serrulatis firme membranaceis utrobique præsertim vero fac. sup. griseo-velutinis, cymis

folia excedentibus terminalibus pluricapitulatis sublaxis, capitulis ad normam generis submediocribus raro sessilibus tubuloso-campanulatis circa 17-flosculosis, involucri pubescentis 5-serialis phyllis exterioribus late ovatis obtusissimis quam interiora oblonga vel oblongo-lanceolata obtusa vel obtuse acuta brevioribus omnibus scarioso-marginatis, flosculis bene exsertis, achæniis parvis turbinatis sursum amplificatis costis 8 prominentibus indutis glabris, pappi setis paucis scabriusculis achænio æquilongis caducissimis.

Hab. Lake shore, Musozi. Fl. December, 10.

Suffrutex ex schedis cl. detectoris aromaticus. Folia adusque 6·5 cm. long., fere 3·0 cm. lat., juniora revera minora; nervi fac. sup. plani, fac. inf. valde eminentes necnon arcte reticulati; petioli 1·0–2·0 cm. long. Cymæ tomentosæ, circa 8·0 cm. long. et circa totidem diam. Pedunculi proprii sæpissime 0·2–0·5 cm. long. Involucrum 0·6 cm. long., 0·5 cm. diam.: phylla extima 0·2 cm., intermedia 0·3–0·4 cm., interiora 0·6 cm. long., illa 0·2 cm., hæc 0·12–0·18 cm. lat. Corollæ 0·6 cm. long. Achænia pappusque 0·2 cm long., illa deorsum 0·03 sursum fere 0·1 cm. diam.

Heads somewhat like those of *E. Schimperi*, S. Moore, but easily distinguished by their short, broad, very obtuse outer involucral leaves.

Erlangea (§ Stephanolepis) **ugandensis**, sp. nov.

E. elata, erecta, copiose foliosa, ramis robustis subteretibus densissime albo-villosis, foliis majusculis lanceolato-ovatis acutis deorsum in petiolum sat longum gradatim attenuatis margine dentatis dentibus acutissimis firme membranaceis supra mox scabriusculis subtus albo-villosis demum villosulis, capitulis pro genere magnis in corymbo terminali paucicephalo folia summa breviter excedente dispositis, pedunculis albo-villosis, involucri hemisphærici 4-serialis phyllis ovatis deorsum firmis sursum appendice scariosa obtusissima onustis extimis appresse albo-villosulis intimis quam reliqua paullo minoribus, flosculis exsertis, achæniis subcylindricis 5-costatis glabris cito calvis, pappi setis paucis scabridis apice angustatis achænio æquilongis.

Hab. Ruchigga. Fl. December, 474.

Herba fere orgyalis (sec. cl. detectorem). Foliorum lamina fere adusque 20·0 cm. long. et 7·0 cm. lat. (juniora 10·0 × 4·0 cm.); nervi fac. sup. plani vel leviter impressi, fac. inf. prominentes; petioli tandem 3·0 cm. long., basi dilatati. Corymbus 12·0 cm. long. Pedunculi proprii 0·3–3·0 cm. long. Involucra 1·5 cm. long. et diam.; phylla extima circa 1·5 cm. long., intima vix ultra 1·0 cm., illa 0·7 cm. lat. Corollæ fere 1·2 cm. long., inferne pubescentes. Achænia et pappus 0·23 cm. long.

A very distinct and fine plant. The heads have somewhat the look of those of *Vernonia calvoana*, Hook. fil.

VERNONIA BRACHYCALYX, *O. Hoffm. in Engler, Pflanzenwelt Ost-Afr.* C. 405.

Near Mulema. Fl. June, 349.

Distrib. Nile Land, Mozambique District, South Central.

V. ELLIOTII, *S. Moore, in Journ. Linn. Soc., Bot.* xxxv. (1902) 315.

Ruchigga. Fl. November, 407.

Distrib. Nile Land (Mau).

V. (§ Lepidella) CAPUT-MEDUSÆ, sp. nov.

V. herbacea, caule simplici stricto subtereti valido a basi folioso albo-hirsuto, foliis parvis sessilibus oblongis junioribus lanceolatis obtusis supra scabriusculis subtus pilis hispidis copiose indutis membranaceis, capitulis mediocribus in corymbo paucicephalo congesto hirsuto digestis circa 40-flosculosis, involucri subhemisphærici hirsuti phyllis 5-seriatis interioribus quam extima longioribus e basi anguste lineari-lanceolato pallido in caudam elongatam albo-hirsutam purpuream exeuntibus intimis linearibus, flosculis breviter exsertis, achæniis oblongo-linearibus 4-costatis costis setuliferis inter costas glandulis pluribus parvis onustis, pappi setis scabriusculis dilutissime stramineis quam squamæ 4-plo longioribus.

Hab. Irunga. 394 A.

Planta fere semimetralis. Folia summum 5·0 cm. long. (juniora 3·5 cm.) et 0·6–1·0 cm. lat., glandulis pellucidis conspersa. Corymbus 5·0 cm. long., hujus bracteæ foliis similes sed multo breviores. Pedunculi proprii nec ultra 0·8 cm. long., sæpius breviores. Capitula 1·5 cm. diam. Receptaculum fimbrillifero-erosum. Involucri phylla extima 0·6 cm., interiora 1·0 cm. long. Corollæ 0·8 cm.

long., extus glanduloso-puberulæ. Achænia 0·22 cm., pappi setæ 0·5 cm., squamæ 0·12 cm. long.

This comes nearest *V. karongensis*, Baker, which is referred by Baker (Kew Bull. (1898) 147) to § *Cyanopis* by an evident oversight. From that species it is at once known by its congested inflorescences and larger involucres with long coarse tails to their leaves.

VERNONIA AMYGDALINA, *Del. Voy. à Méroë*, 41.
Hillside near Mulema. Fl. June, 339.
Distrib. Nile Land, Mozambique District, Upper and Lower Guinea.

V. SENEGALENSIS, *Less. in Linnæa*, iv. (1829) 265.
Hillside, Musozi. Fl. January, 119.
Native name "Murulosa." "An infusion made from the leaves of this is used as a remedy for pains in the abdomen."
Distrib. Nile Land, Mozambique District, South Central, Upper and Lower Guinea. Also in Madagascar.

V. TENOREANA, *Oliver, in Trans. Linn. Soc.* xxix. (1873) 92.
Hillside, Mulema. Fl. April, 243. "Sticks used in hut-building."
Distrib. Upper Guinea, Central Lake District.

V. NANDENSIS, *S. Moore, in Journ. Linn. Soc., Bot.* xxxv. (1902) 323.
Hillside, Burumba. Fl. July, 376.
Distrib. Nile Land (Nandi).

V. THOMSONIANA, *Oliver & Hiern, in Trans. Linn. Soc.* xxix. (1873) 91.
Hill near Rufúa. Fl. January, 543.
Distrib. Central Lake District, South Central.

V. PODOCOMA, *Sch. Bip. ex Oliver & Hiern, in Fl. Trop. Afr.* iii. 296.
Ruchigga. Fl. November, 400.
Distrib. Nile Land, Mozambique District.

V. AURICULIFERA, *Hiern, Welw. Cat.* i. 539.
In gully, Burumba. Fl. July, 375.
Distrib. Lower Guinea.

MIKANIA SCANDENS, *Willd. Sp. Pl.* iii. 1743. (Willugbæya scandens, *O. Kuntze, Rev. Gen. Pl.* i. 371.)
Marshy forest, Musozi. Fl. January, 112 & 130.
Widely distributed.

MICROGLOSSA DENSIFLORA, *Hook. fil. in Journ. Linn. Soc., Bot.* vii. (1864) 200.
Ruchigga. Fl. November, 450.
Distrib. Nile Land, Mozambique District (Northern part), Upper Guinea.

BLUMEA LACERA, *DC. in Wight, Contrib. Bot. Ind.* 14.
River Rufúa. Fl. December, 510.
Widely distributed through the tropics of the Old World.

SPHÆRANTHUS SUAVEOLENS, *DC. Prod.* v. 370.
Below Ruchigga. Fl. December, 489.
Distrib. Nile Land, South Central, Lower Guinea. Also in Egypt.

BLEPHARISPERMUM PUBESCENS, sp. nov.

B. caule scandente angulato eximie striato glabro vel glabrescente spinis debilibus brevibus decurvis hinc inde onusto, ramulis crebro foliatis griseo-pubescentibus, foliis ad normam generis mediocribus ovatis acutis vel acuminatis basi nunc latissime truncatis nunc spathulatis nunc in petiolum brevem cuneatim angustatis margine dentatis vel breviter dentato-lobulatis rarius integris vel subintegris membranaceis griseo-pubescentibus supra cito scabriusculo-puberulis pube glandulis minimis lucentibus intermixta, capitulorum glomerulis solitariis sphæroideis, capitulis heterogamis 4-(rarissime 5-) flosculosis flosculis fem. 2 (rarius 3) hermaph. 2 sterilibus, involucri phyllis receptaculique paleis late oblongis his cymbiformibus apice sæpe dentatis, flor. hermaph. corollis campanulato-tubulosis 5-lobis, flor. fem. parvis anguste tubulosis 3-dentatis, achæniis fertilibus oblongo-obovatis compressis utrinque 1-costatis margine longe albo-ciliatis ceteroquin glabris, pappi squamis circa 10 alteris quam alteræ paullo longioribus subulatis achh. sterilium 5–6 latis vel angustis.

Hab. Near Mulema. Fl. April, 225 & 599.

Folia 3·5–6·0 cm. long., 1·5–2·5 (rarissime 3·5) cm. lat.,

eleganter reticulata; petioli 0·3–0·6 cm. long., pubescentes. Pedunculi sæpissime 1·0–2·0 cm. long., pubescentes. Capitulorum glomeruli 1·2 cm. long., 1·4 cm. diam. Involucri phylla 0·25 × 0·1 cm., carinata, dorso apice puberula. Receptaculi paleæ ægre 0·6 cm. long., 0·2 cm. lat. Corollæ hermaph. 0·35 cm. long., fem. 0·13 cm. Achænia fertilia 0·3×0·13 cm., sterilia 0·2 cm. long. Pappi squamæ 0·1–0·2 cm. long., achh. sterilium 0·2 cm. long.

Nearest *B. spinulosum*, Oliver & Hiern, the pubescence, shape of leaves, heads with only two hermaphrodite florets, and quite different achenes being among the points of difference.

ACHYROCLINE HOCHSTETTERI, *Sch. Bip. ex A. Rich. Tent. Fl. Abyss.* i. 429.

Ruchigga. Fl. December, 476.

Distrib. Nile Land, Mozambique District, Upper and Lower Guinea.

HELICHRYSUM LEIOPODIUM, *DC. Prod.* vi. 200.

Irunga. Fl. November, 387.

Distrib. Nile Land, Mozambique District, South Central, Lower Guinea. Also in South Africa.

H. CYMOSUM, *Less. Syn.* 302; var. COMPACTUM, *Vatke.*

Ruchigga. Fl. December, 476 A.

Distrib. Nile Land, Mozambique District, South Central, Upper Guinea. Also in South Africa.

H. (§ Chrysolepidea, Stœchadina) GALBANUM, sp. nov.

H. fruticosum, superne sparsim ramosum, araneo-tomentosum, caule tereti longitrorsum multistriato verisimiliter tandem glabro, foliis subsessilibus lanceolatis vel lanceolato-ovatis apice pungentibus basi obtusis nequaquam auriculatis, capitulis parvis cylindricis 5–6-flosculosis heterogamis in glomerulis densis multicephalis cymas corymbosas terminales raribracteatas efformantibus dispositis, involucri 4-serialis phyllis inter se æquilongis anguste obovato-oblongis obtusis vel obtuse acutis haud radiantibus citrinis, receptaculo breviter foveolato, flosculis fem. 1–2, achæniis maxime crudis parvulis glabris, pappi setis circa 25 corollas paullulum superantibus glabris albis.

Hab. Ruchigga. Fl. November, 454.

Folia 3·0 cm. × 1·0–1·5 cm., seniora deinde pag. sup. dilute rubescentia, reliqua utrobique pallide grisea; petioli 0·1–0·3 cm. long. Cymæ circa 5·0 cm. long., 6·0 cm. diam.; harum bracteæ foliis similes sed plane minores. Capitula 0·4 cm. long., 0·13 cm. lat. Involucri phylla 0·33 cm. long. Corollæ 0·22 cm. long. Receptaculum 0·03 cm. diam. Achænia 0·025 cm., pappus 0·3 cm. long.

To be placed in the neighbourhood of *H. rutilans*, Less., and *H. abyssinicum*, Sch. Bip., but at once distinguished from them by the narrow heads with few floscules.

Helichrysum globosum, *Sch. Bip. ex A. Rich. Tent. Fl. Abyss.* i. 425; var.

Ruchigga at 7000 feet. Fl. December, 524.

Distrib. Nile Land, Mozambique District, Upper and Lower Guinea. Also a Mascarene species.

Anisopappus africanus, *Oliver & Hiern, Fl. Trop. Afr.* iii. 369.

Hill near the Rufúa. Fl. January, 548.

Distrib. Nile Land, Mozambique District, South Central.

Spilanthes Acmella, *Murr. in Linn. Syst.* ed. XIII. 610.

Ruchigga and near the Rufúa. Fl. November and January, 460 & 541.

A plant of wide distribution through the Old World.

Coreopsis arenicola, sp. nov.

C. fruticulosa caule erecto crebro ramoso in longitudinem multistriato glabro una cum ramulis puberulis gracili, foliis parvis sessilibus pinnatisectis (summis 3-sectis) jugis sæpius 2 anguste linearibus obtuse acutis ut rhachis angusta in pag. inf. minute pubescentibus membranaceis, capitulis submediocribus ad apices ramulorum corymbos laxos oligocephalos formantibus, pedunculis elongatis gracillimis puberulis, involucri campanulati 2-serialis phyllis exterioribus herbaceis anguste lineari-oblongis obtusis dorso pilis brevibus appressis minutis quam interiora ovata vel ovato-oblonga integra vel bifida multo brevioribus, ligulis 8 flavis oblongo-lanceolatis apice integris involucrum manifeste superantibus, achæniis compressis lineari-oblongis inferne leviter ac gradatim attenuatis in utraque facie subtiliter costatis haud alatis superne ciliatis, pappi aristis 2 quam achænia insigniter brevioribus tenuibus nudis.

Hab. In dry sand by Lake Victoria Nyanza at Musozi. Fl. December, 12.

"Low shrub," sec. cl. Bagshawe. Folia modica 1·5–2·5 cm. long.; horum lobi 0·3–0·8 cm. long., nec ultra 0·1 cm. lat. Pedunculi solemniter 3·0–5·0 cm. long., nudi vel sparsissime bracteati; bracteis dum adsint filiformibus. Capitulum pansum circa 1·5 cm. diam. Involucri phylla exteriora 0·35 cm., interiora 0·6 cm. long. Receptaculi paleæ oblongæ, obtusissimæ, 3-nerves. Ligulæ 1·1 cm. long., 0·33 cm. lat., perspicue 11-nerves. Achænia 0·6–0·75 cm. long., summum 0·1 cm. lat. Pappi aristæ vix adusque 0·1 cm. long.

Known by the slender habit, the small deeply-divided leaves with narrow lobes, the narrow herbaceous outer involucral leaves much shorter than the broad inner ones, the narrow multinerved ligules, and the narrow achenes with very short awns.

CRASSOCEPHALUM DIVERSIFOLIUM, *Hiern, Welw. Cat.* i. 594; var. CREPIDIOIDES, *Hiern.*

Ruchigga. Fl. December, 483.

Widely distributed through Tropical Africa.

C. RUWENZORIENSE, *S. Moore, in Journ. Linn. Soc., Bot.* xxxv. (1902) 352.

Mouth of the Kagera River. Fl. December, 34.

Distrib. Central Lake District.

C. (Gynura) AURIFORME, sp. nov.

C. fruticosum, scandens, ramulis bene foliosis alte sulcatis pilis crassis articulatis dense pubescentibus, foliis circuitu cordatis apice obtusis margine dentatis vel breviter dentato-lobulatis supra scabride subtus molliter pubescentibus firme membranaceis petiolis quam lamina brevioribus pubescentibus basi auriculis 2 sat magnis onustis, capitulis homogamis circa 40-flosculosis in corymbo pluricephalo bracteato subdenso dispositis, involucri oblongi phyllis 11–13 linearibus apice sphacelatis margine membranaceis dorso piloso-puberulis adjectis calyculi phyllis paucis parvis ciliatis, corollis involucrum superantibus, achæniis angustis 10-striatis quam pappus albus glaber manifeste brevioribus.

Hab. Island of Buvúma, Lake Victoria Nyanza. Fl. March, 657.

Folia (petiolo excl.) modice 5·0–6·0 cm. long., et 4·0 cm. lat. (interdum vero 3·5–4·0 × 2·5–3·0 cm.), basi palminervia; petioli 1·5–2·0 cm. long.; auriculæ summum 0·5 × 1·0 cm., utrinque sparsim pubescentes. Corymbus circa 7·0 cm. long. et diam.; hujus bracteæ infimæ folia mentientes, reliquæ parvæ et in calyculi phylla transeuntes. Calyculi phylla 0·4 cm. long. Capitula pansa 1·3 cm. long. et 0·8 cm. diam. Involucri phylla 1·0 cm., corollæ flavo-brunnescentes 1·1 cm., styli ramorum appendices fere 0·2 cm., achænia 0·3 cm., pappus 0·85 cm. long.

Gynura scandens, O. Hoffm., has differently shaped leaves without auricles, fewer and shorter involucral leaves, narrower and fewer flosculed heads, &c. The plant here described is also near that named by me *Crassocephalum ruwenzoriense*, but its pubescence, auricled leaves, and longer involucres with more numerous and narrower leaves, are among its distinguishing points.

EMILIA DEBILIS, sp. nov.

E. annua, tenera, caule gracili parum ramoso piloso-pubescente cito piloso, foliis perpaucis sessilibus anguste oblanceolato-oblongis utrinque obtusis crassiusculis albo-piloso-puberulis, capitulis perpaucis ramulos solitatim coronantibus longissime pedunculatis piloso-pubescentibus parvis ∞-flosculosis, involucri cylindrici phyllis 8 basi conjunctis linearibus obtusis extus piloso-puberulis, corollis breviter exsertis, styli ramis appendice brevi subulata glabra coronatis, achæniis cylindricis 10-costatis costis vel intervallis albo-pilosulis glabrisve, pappi setis glabris albis.

Hab. Ruchigga. Fl. November, 444.

Planta adusque 40·0 cm. alt. Folia solemniter 2·5–3·5 cm. long., 0·7 cm. lat., margine paullulum revoluta, subtus pallida, costulæ fere evanidæ. Pedunculi adusque 15·0 cm. long., bracteis 0·5–1·5 cm. long. rarissimis præditi. Involucri phylla 0·8 cm. long. Corollæ flavæ, 0·6 cm. long., lobi 0·1 cm. Styli rami vix 0·1 cm. long., horum appendices 0·02 cm. Achænia 0·22 cm., pappi setæ 0·5–0·7 cm. long.

Known by the indumentum, the small and narrow sessile leaves, the long peduncles, and the slender subulate appendages to the style-arms.

NOTONIA ABYSSINICA, *A. Rich. Tent. Fl. Abyss.* i. 444.
Musozi. Fl. December, 68.
Distrib. Nile Land.

N. WELWITSCHII, *Hiern, Welw. Cat.* i. 596.
Below Ruchigga. Fl. December, 488.
Distrib. Lower Guinea.

SENECIO MULTICORYMBOSUS, *Klatt, in Ann. k.-k. Hofmus. Wien*, vii. (1892) 103.
Musozi. Fl. January, 105.
Native name "Kiraránkuba." "The leaves are used in fever."
Distrib. Nile Land, Mozambique District, Lower Guinea.

S. TABULICOLUS, *Baker, in Kew Bull.* (1898) 155.
Ruchigga, 7000 feet. Fl. November, 419.
Distrib. Mozambique District (Nyassaland).

S. BAGSHAWEI, sp. nov.

S. herbaceus, elatus, caule robusto bene foliato sinuato sulcato cito puberulo, foliis radicalibus vel saltem fere radicalibus magnis ovato-oblongis obtusissimis basi alte cordatis margine dentatis dentibus induratis albis petiolis crassis late alatis fultis membranaceis supra glabris subtus araneoso-puberulis, foliis junioribus radicalibus similibus nisi multo minoribus et ambitu ovatis et subtus araneoso-pubescentibus, capitulis mediocribus heterogamis radiatis circa 30-flosculosis in corymbosis longis terminalibus pluricephalis patulis dispositis, pedunculis propriis capitula longe excedentibus bracteis setaceis in calyculi phylla transeuntibus onustis, involucri campanulati phyllis 13 lineari-oblongis apice sphacelatis acutis margine membranaceis dorso araneoso-puberulis, ligulis 7 flavis extra involucrum longe egressis, styli ramis truncatis penicillatis, achæniis lineari-oblongis 10-costatis glabris, pappi setis scabriusculis albis.

Hab. Ruchigga. Fl. November, 405.

Herba fere orgyalis. Folium radicale unicum solum suppetitum fere 40·0 cm. long. (petiolo saltem 16·0 cm. long. excluso), basi 22·0 cm. superne 10·0–14·0 cm. lat., supra viride, subtus griseum; costa centralis subtus valde prominens, longitrorsum costatus; costæ secundariæ utrinque

circa 20 in pag. inf. eminentiores. Folia superiora ± 10·0 cm. long., 6·0–9·0 cm. lat.; horum petioli 4·0–6·0 cm. long., alis dentatis basi dilatatis uti lamina vestitis. Corymbus 20·0–30·0 cm. long., et circa 10·0 cm. diam., deorsum bracteis paucissimis foliis similibus nisi multo minoribus onustus, multistriatus, puberulus. Pedunculi proprii ± 4·0 cm. long.; horum bracteæ et calyculi phylla circa 0·3 cm. long. Capitula pansa circa 2·0 cm. diam. Involucri phylla 0·8 cm. long., 0·15–0·2 cm. lat. Ligula (lamina) 1·0 cm. long., oblonga, apice 3-denticulata, plurinervosa. Fll. hermaph. corollæ 0·9 cm. long.; tubus usque ad medium valde attenuatus hinc gradatim expansus. Styli rami 0·2 cm., achænia 0·5 cm., pappus 0·75 cm. long.

This very fine plant is allied to *S. Burtoni*, Hook. fil., which, to go no further into the matter, has entirely different leaves.

SENECIO PETITIANUS, *A. Rich. Tent. Fl. Abyss.* i. 422.
Bank of River Kagera near Mulema. Fl. June, 358.
Distrib. Nile Land.

S. MARANGUENSIS, *O. Hoffm. in Engler, Pflanzenwelt Ost-Afr.* C. 418.
Near Mulema. Fl. June, 328.
Distrib. Nile Land (South-eastern part).

S. SUBSCANDENS, *Hochst. ex A. Rich. Tent. Fl. Abyss.* i. 434.
Below Ruchigga. Fl. December, 496.
Distrib. Nile Land, Mozambique District, Lower Guinea. Also Mascarene Islands and in S.W. Arabia.

S. RUWENZORIENSIS, *S. Moore, in Journ. Linn. Soc., Bot.* xxxv. (1902) 355.
Ruchigga. Fl. November, 410.
Distrib. Central Lake District.

ECHINOPS AMPLEXICAULIS, *Oliver, in Trans. Linn. Soc.* xxix. (1873) 101.
Hillside, Mulema. Fl. April, 248.
Distrib. Nile Land, Mozambique District (Northern part).

E. (§ Cenchrolepis) BREVISETUS, sp. nov.
Herba erecta caule robusto folioso intricate albo-tomentoso, foliis sessilibus elongatis ambitu ovato-oblongis alte

pinnatifidis segmentis iterum pinnatifidis lobis in spinam rigidam excurrentibus segmentis infimis summisque integris omnibus ut rhachis supra pilis hispidis scabridis præditis subter dense albo-tomentosis, capitulorum glomerulis solitariis majusculis globosis breviter pedunculatis, receptaculo communi anguste ovoideo, involucri partialis setis a phyllis intermediis lanceolatis juxta apicem spinosum fasciculato-spinulosis fere 4-plo superatis, phyllis intimis ultra medium connatis apice laceris, receptaculo partiali nudo, corolla longe exserta, antherarum auriculis leviter fimbriatis, achæniis involucri phylla intima semiæquantibus pilosis, pappi setis basi connatis.

Hab. Hillside at Burumba. Fl. July, 377.

Folia adusque 40·0 cm. long. (summa multo breviora) et 10·0 cm. lat.; segmenta intermedia 6·5–8·0 cm. long., horum lobi triangulares, fere 2·0 cm. long.; segmenta summa et infima 1·0–2·5 cm. long.; rhachis communis 1·0 cm. lat. Capitulorum glomeruli 7·0–8·0 cm. diam. Receptaculum commune vix 1·5 cm. alt. Involucri partialis setæ 0·6 cm. long.; phylla perpauca extima sæpe apice debiliter fasciculato-spinulosa 1·1–1·5 cm., phylla interiora 2·3 cm. long., ad 0·8 cm. infra apicem spinulifera; phylla intima 1·9 cm. long., horum pars libera 0·6–0·7 cm. long. Achænia 1·0 cm., pappus 0·12 cm. long.

Near *E. giganteus*, A. Rich., and *E. chamæcephalus*, Hochst., but easily distinguished from both by the different lobing of the leaves and the very short involucral setæ.

PERDICIUM ABYSSINICUM, *Hiern, Welw. Cat.* i. 615.
Mulema. Fl. April, 201.
Distrib. Common in Tropical Africa.

SONCHUS BIPONTINI, *Aschers. in Schweinf. Beitr. Fl. Æthiop.* 160; var. PINNATIFIDUS, *Oliver & Hiern.*
Ruchigga. Fl. November, 458.
Distrib. (of species). Nile Land, Mozambique District.

CAMPANULACEÆ.

LOBELIA FERVENS, *Thunb. Fl. Cap.* ii. 46.
Shore of Lake Victoria Nyanza at Mbazi. Fl. March, 574.
Distrib. Mozambique District. Also in South Africa and Mascarene Islands.

Lobelia gibberoa, *Hemsl. in Oliver, Fl. Trop. Afr.* iii. 465.

Ruchigga at 7100–7200 feet. Fl. January, 436. "Only two specimens were seen in flower. The spike measured 5 feet 10 inches in length. Petals light yellow with a green tinge and satiny sheen."

Distrib. Nile Land (Abyssinia).

Lightfootia collomioides, *A. DC. in Ann. Sc. Nat.* sér. V. vi. (1866) 328.

Hill-top near Mulema and at Ruchigga. Fl. June, 335 & 408.

Distrib. Lower Guinea.

L. kagerensis, sp. nov.

L. herbacea caule debili angulato piloso-puberulo ramulos paucos prolixos patentes sat graciles scabride puberulos emittente, foliis sessilibus graminoideis linearibus apice apiculatis apiculo interdum curvato margine albo denticulis sparsis minutis atris onusto chartaceis subtus hispidulo-pilosis, floribus in paniculis elongatis spicas mentientibus ramulos terminantibus dispositis ramulis secundi ordinis perbrevibus folia parvula gerentibus suffultis, bracteis subulatis calyce brevioribus, pedicellis quam calyx brevioribus, calycis tubo hemisphærico hispidulo lobis triangulari-deltoideis integerrimis glabris æquilongo, corollæ lobis calycinos plus quam duplo excedentibus anguste linearibus dilute cæruleis margine ciliolatis, ovario ½-supero, stigmate trifido, capsula vertice conica 3-valvi.

Hab. Hill near mouth of the Kagera. Fl. February, 566.

Radix sat tenuis, sparsim fibrilliferus. Folia 2·5–4·0 cm. long. (superiora circa 1·5 cm.), 0·1 cm. raro 0·2 cm. lat. Inflorescentiæ circa 20·0 cm. long. Ramuli florigeri sæpissime 0·1–0·2 cm. long. Folia floralia circa 0·5 cm., bracteæ summum 0·2 cm. long. Calycis tubus ut lobi 0·2 cm. long. Corollæ lobi 0·45 cm. long. Stylus 0·3 cm. long., superne incrassatus. Stigmatis lobi 0·05 cm. long. Capsula tota 0·3 cm., pars libera 0·15 cm., valvæ 0·07 cm. long.

Differs from *L. marginata*, A. DC., chiefly in laxer habit, much narrower and relatively longer grass-like leaves, and more laxly arranged flowers with different floral leaves.

Ericaceæ.

Philippia Holstii, *Engler, Pflanzenwelt Ost-Afr.* C. 302.

Ruchigga. Fl. November, 434.

Distrib. Mozambique District (Usambara).

PLUMBAGINEÆ.

PLUMBAGO ZEYLANICA, *Linn. Sp. Pl.* 151.

Kagera Valley near Mulema. Fl. May, 278.

Native name "Nkira." "The roots are eaten for gonorrhœa."

Widely distributed through tropics of the Old World.

MYRSINEÆ.

MÆSA RUFESCENS, *A. DC. in DC. Prod.* viii. 81.

Musozi. Fl. & Fr. December, 60.

Distrib. South Central, Mozambique District, Upper and Lower Guinea. Also in South Africa.

Native name "Kyawondowando." "The unripe fruits are pounded, dried, mixed with cow's fat and used as an application for itch."

SAPOTACEÆ.

MIMUSOPS PROPINQUA, sp. nov.

M. arborea ramis bene foliosis glabris griseis longitrorsum rimosis, foliis petiolatis obovato-oblongis obtusissimis basi cuneatis in sicco griseis supra glabris subtus pallidioribus et minutissime lepidotis tenuiter coriaceis costis secundariis numerosis parum perspicuis, floribus 3-meris pedunculatis axillaribus vel exaxillaribus solitariis vel umbellatis, alabastris acutis, calycis lobis anguste ovato-oblongis una cum pedunculi parte superiori minutissime fulvo-pubescentibus, corollæ albæ lobis 18 linearibus obtusis integris, staminibus 6, staminodiis lineari-oblongis sursum laceris quam stamina paullo brevioribus, ovario globoso minute pubescente, stylo longiusculo glabro.

Hab. Shore of Lake Victoria Nyanza at Musozi. Fl. January, 76.

Foliorum lamina 6·0–10·0 cm. × 3·5–5·0 cm.; costa media supra impressa subtus eminens; petiolus 1·0–1·5 cm. long., supra sulcatus. Pedunculi 0·5–0·7 cm., alabastra 0·6 cm. long. Calycis lobi 0·6 cm. long., grisei. Corollæ tubus 0·2 cm., lobi 0·4 cm. long. Filamenta 0·35 cm., antheræ 0·3 cm. long. Staminodia 0·3 cm. long., horum pars indivisa circa 0·2 cm. long. Stylus validus, parum curvatus, 0·6 cm. long.

Nearest *M. lacera*, Baker, which has long-pedicelled flowers, a shorter calyx, and differently shaped staminodes.

Dr. Bagshawe notes this as being "a tree 13 feet in circumference at 5 feet from the ground." Its native name is "Mukunya." The fruit is eaten.

CHRYSOPHYLLUM STUHLMANNI, *Engler, Pflanzenwelt Ost-Afr.* C. 306.

Musozi and Buvúma Island. Fl. December & January, Fr. March. 63, 88, 667.

Native name "Mukarata." "A large tree commencing to branch low down. Flowers greenish; fruit eaten."

Distrib. Mozambique District.

OLEACEÆ.

JASMINUM DICHOTOMUM, *Vahl, Symb.* i. 26.

Shore of lake at Musozi, and on Buvúma Island. Fl. January & March, 98 & 603.

Distrib. Upper and Lower Guinea.

J. RADCLIFFEI, sp. nov.

J. fruticosum crebro ramosum ramis sat validis teretibus cinereis vel brunnescentibus glabris, ramulis tenuibus bene foliosis patule pubescentibus, foliis oppositis brevipetiolatis ovatis acutis obtusisve nonnunquam obtusissimis basi rotundatis firme membranaceis utrinque præter pilos in costa centrali et axillis fac. inf. hirsutis glabris margine ciliatis, petiolis pubescentibus, cymis plurifloris bracteatis pubescentibus axillaribus et terminalibus quam folia sæpius brevioribus, floribus brevipedunculatis, calycis tubo subcampanulato lobis 5–6 subulatis æquilongo, corollæ albæ tubo tenui elongato quam lobi 7 lanceolati obtusi duplo longiore.

Hab. Kagera Valley, near Mulema. Fl. May, 254.

Folia nunc 4·5–5·5 × 2·2–3·0 cm., nunc modo 2·0–2·5 × 1·3–1·6 cm., subtus pallidiora; costæ secundariæ utrinque 4–5, leviter arcuatæ, juxta marginem inter se anastomosantes; petioli 0·3 cm. long. Bracteæ summum 0·5 cm., pedunculi 0·2–0·6 cm. long., hi compressiusculi. Calycis tubus 0·25 cm. long., 0·2 cm. diam.; lobi 0·22 cm. long. Corollæ glabræ, suaveolentes; tubus superne levissime ampliatus,

2·0–2·2 cm., lobi 1·0 cm. long. Filamenta 0·1 cm., antheræ leviter curvatæ, 0·3 cm. long. Stylus brevis, inclusus, parum clavellatus, superne pubescens. Stigma bifidum.

Evidently near *J. Emini*, Gilg, a plant known to me only by description, which indicates a different indument and corollas. The native name is "Nkanga nyonza."

JASMINUM BLANDUM, sp. nov.

Suffrutex prostratus ramulis copiose foliosis crispe pubescentibus, foliis oppositis petiolatis trifoliatis foliolis lateralibus petiolulis quam se ipsa manifeste brevioribus fultis omnibus parvis lanceolatis vel lanceolato-ovatis basin versus angustatis apice breviter acuminatis vel incurvo-uncinulatis chartaceis puberulis, cymis terminalibus vel axillaribus plurifloris folia subæquantibus pubescentibus, bracteis subulato-linearibus quam pedunculi longioribus, calycis pubescentis tubo subcampanulato lobis triangulari-subulatis quam tubus multo brevioribus, corollæ glabræ tubo elongato tenui superne levissime dilatato lobis 6 oblongis obtusis quam tubus paullo brevioribus.

Hab. Below Ruchigga. Fl. December, 500.

Foliola 1·5–2·5 cm. long., 0·7–1·5 cm. lat.; costæ secundariæ paucæ, obscuræ; petioluli laterales 0·3–0·5 cm., terminalis 0·5–1·0 cm. long., pubescentes. Bracteæ ± 0·3 cm. long. Pedunculi circa 0·2 cm. long. Calycis tubus 0·32 cm. long., 0·3 cm. diam.; lobi 0·1 cm. long. Corollæ tubus 1·5–2·0 cm. long.; lobi 1·2 cm. long. Antheræ apice acuminatæ, 0·5 cm. long. Stylus exsertus, sursum leviter incrassatus. Stigma crassum, breviter bifidum.

To be inserted next *J. mauritianum*, Bojer, from which the small lanceolate leaflets, *narrowed at the base*, serve at once to distinguish it. There are also differences in the flowers of the two.

APOCYNACEÆ.

PACOURIA OWARIENSIS, *Hiern, Welw. Cat.* i. 661.

Shore of Lake Victoria Nyanza at Mutunda. Fl. March, 583.

Distrib. Nile Land, Upper and Lower Guinea, South Central.

PACOURIA PETERSIANA, *S. Moore*, var. SCHWEINFURTHIANA. (*Landolphia Petersiana*, Dyer, var. *Schweinfurthiana*, Stapf.
Near Mulema. Fl. April, 205.
Native name "Rasanda."
Distrib. Nile Land, Mozambique District.

CLITANDRA CYMULOSA, *Benth. in Hook. Niger Fl.* 445.
Wema Island. Fl. March, 593.
Distrib. Upper Guinea.

CARANDAS EDULIS, *Hiern, Welw. Cat.* i. 664.
Mulema, Ruchigga, and Buvúma Island. Fl. March, April, November, 204, 430, 665.
Distrib. Nile Land, Mozambique District, Upper and Lower Guinea.

RAUWOLFIA VOMITORIA, *Afz. Stirp. Guin. Med. Sp. Nov.* 1.
Buvúma Island. Fl. March, 645.
Distrib. Mozambique District, South Central, Upper and Lower Guinea.

VOACANGA OBTUSA, *K. Schum. in Engl. & Prantl, Pflanzenfam.* IV. ii. 149.
In marshy forest at Musozi. Fl. January, 82 & 131.
Native name "Mutengo." "Wood used to make handles for tools."
Distrib. Nile Land, South Central, Upper and Lower Guinea.

STROPHANTHUS HISPIDUS, *DC. in Bull. Soc. Philom.* iii. (1802) 123.
Shore of Lake Victoria Nyanza at Musozi, also Mutunda. Fl. March. Fr. January, 128, 585.
Distrib. South Central, Upper and Lower Guinea.

S. BRACTEATUS, *Franch. in Journ. de Bot.* vii. (1893) 324.
Buvúma Island. Fl. March, 611.
Distrib. Lower Guinea.

S. RADCLIFFEI, sp. nov.
S. scandens, glaber, ramulis teretibus gracilibus, foliis oppositis parvis brevipetiolatis lanceolato-oblongis acutis vel cuspidato-acuminatis basi obtusis membranaceis costis secundariis utrinque circa 8 utrobique planis delicatulis,

floribus ad normam generis parvis in corymbis paucifloris ramulos breves pusillifoliatos coronantibus dispositis, pedicellis calyce longioribus, calycis lobis parvis ovato-lanceolatis acutis, corollæ tubo calycem paullulum excedente juxta medium antherifero infra os squamis 5 trilobis onusto lobis oblongis sursum leviter ac gradatim attenuatis tubum 4-plo excedentibus, antheris triangulari-lanceolatis breviter sagittatis.

Hab. Shore of Lake Victoria Nyanza at Mutunda. Fl. March, 589.

Folia modice 3·5–4·5 cm. long., 1·5–2·0 cm. lat.; petioli 0·5–0·7 cm. long. Ramuli florigeri summum 2·5 cm. long. Pedicelli ± 1·0 cm. long. Flores lutei. Calyx humectatus 0·4 cm. long., intus pluriglandulosus. Corollæ tubus 0·45 cm. long., 0·3 cm. diam.; lobi 1·8 cm. long., basi 0·25 cm., apicem versus 0·1 cm. lat., aliquantulum torti; squamæ ad 0·15 cm. infra os insertæ, 0·1 cm. long. Antheræ 0·17 cm. long.

Known readily by the small leaves, the small flowers with short tips, the 5 trilobed squamæ inserted a short way down the tube instead of at the mouth, &c.

ALAFIA GRANDIS, *Stapf, in Dyer, Fl. Trop. Afr.* iv. 196.
Buvúma Island. Fl. & Fr. March, 597.
Distrib. Upper Guinea.

A. SCHUMANNII, *Stapf, l. c.* 197.
Buvúma Island. Fl. March, 640.
Distrib. Upper Guinea.

A. LANDOLPHIOIDES, *K. Schum. in Engl. & Prantl, Pflanzenfam.* IV. ii. 165.
Buvúma Island. Fl. March, 651.
Distrib. Upper Guinea.

A. LUCIDA, *Stapf, in Kew Bull.* (1894) 122.
Shore of Lake Victoria Nyanza at Musozi. Fl. January, 94.
Distrib. Nile Land, Mozambique, Upper and Lower Guinea.

A. CLUSIOIDES, sp. nov.

A. scandens, crebro ramosa, glabra, ramulis cinereis sursum foliosis, foliis lanceolato-oblongis apice cuspidatis necnon obtusis basi in petiolum brevem angustatis coriaceis nitidis

supra in sicco castaneis subtus pallidioribus costis secundariis numerosis approximatis, floribus in cymis brevibus paucifloris digestis, pedicellis elongatis gracilibus, calycis lobis oblongis obtusis margine ciliolatis et angustissime membranaceis, corollis flavis ore rubro contracto tubo anguste ovoideo infra staminum insertionem dense pubescente sursum transversim rugato lobis tubum bene excedentibus obovatis obtusissimis supra glanduloso-pubescentibus marginibus involutis glanduloso-ciliatis, antherarum cono omnino incluso.

Hab. Buvúma Island, Lake Victoria Nyanza. Fl. March, 620.

Folia modice circa 5·0 cm. long., et fere 2·0 cm. lat.; costæ secundariæ utrinque circiter 20, fac. sup. planæ et parum aspectabiles, fac. inf. ut costa centralis eminentes: costulæ laxe reticulatæ; petioli 0·3–0·5 cm. long., sursum sulcati. Pedunculi 0·5–2·0 cm. long. Cymæ solemniter 4–5-floræ, circa 3·0 cm. diam. Bracteæ lanceolatæ, 0·1–0·2 cm. long. Pedicelli modici 1·0 cm. long. Calycis lobi 0·22 cm. long.; glandulæ calycinæ ovatæ, 0·06 cm. long. Corollæ tubus 0·6 cm. long., ima basi 0·18 cm. juxta medium 0·25 cm. lat.; os 0·12 cm. diam.; lobi 1·3 cm. long. Ovarium pubescens. Stylus clavatus, 0·2 cm., stigma 0·1 cm. long.

Easily recognised by the small leaves with numerous secondary nerves and the corollas with lobes considerably longer than the tube.

BAISSEA TENUILOBA, *Stapf, in Kew Bull.* (1894) 124.

Shore of Lake Victoria Nyanza at Mutunda. Fl. March, 584.

Distrib. Upper Guinea.

ASCLEPIADEÆ.

SECAMONE PLATYSTIGMA, *K. Schum. in Engl. Jahrb.* xvii. (1893) 143.

Shore of Lake Victoria Nyanza at Mbazi. Fl. February, 587 & 568.

Distrib. Nile Land, Lower Guinea.

S. PHILLYREOIDES, sp. nov.

S. ramulis gracilibus copiose foliosis fulvo-pubescentibus, foliis parvis brevipetiolatis oblongis vel oblongo-lanceolatis obtuse acutis vel brevissime cuspidulatis basi obtusis coriaceis utrinque (sed præcipue subtus) pubescentibus dein glabrescentibus, cymis patulis plurifloris compositis folia æquantibus vel quam ea brevioribus fulvo-pubescentibus, calycis lobis late ovatis obtusissimis extus rufo-pubescentibus, corollæ subalte partitæ lobis obovato-oblongis obtusis albo-marginatis intus prope basin bilamellatis, coronæ phyllis parvis subulatis quam gynostegium dimidio brevioribus, stylo antheris æquilongo apice subplano.

Hab. Gorge near Mulema. Fl. May, 283.

Folia modice 2·0 cm. long. (pauca majora 2·5 cm.) et 0·8–1·0 cm. lat.; petioli 0·2 cm. long.; costæ fac. sup. impressæ, costa media fac. inf. eminens, costæ secundariæ planæ; lamina glandulis pellucidis difficile pervisis instructa. Cymæ 1·5–2·0 cm. diam. Pedicelli plerumque 0·3–0·4 cm. long.; bracteæ fere 0·1 cm. Flores sec. cl. detectorem virescentes, 0·25 cm. diam. Calycis lobi ægre 0·1 cm. long. Corollæ lobi extra puberuli, 0·12 cm. (tubus 0·05 cm.) long. Coronæ phylla 0·04 cm., gynostegium 0·08 cm. long.

To be inserted between *S. Whytei*, N. E. Br., and *S. Stuhlmanni*, K. Schum., having, roughly speaking, the leaves of the latter and the former's open inflorescences. The inflorescences of *S. Whytei* are still more open, with longer pedicels to the flowers, its corolla has a longer tube relatively to the limb, the coronal lobes are as long as the gynostege, and the style is exserted far beyond the anthers. Besides its compact cymes, *S. Stuhlmanni* has oblong calyx-lobes, corollas divided nearly to the base, and the style slightly exceeding the gynostege.

SECAMONE RARIFLORA, sp. nov.

S. ramulis gracilibus bene foliosis fulvo-pubescentibus, foliis parvis subsessilibus oblongo-lanceolatis obtusis brevissimeve cuspidulato-apiculatis basi rotundatis coriaceo-membranaceis fac. inf. primo pubescentibus vel saltem puberulis deinde glabris, cymis apertis paucifloris quam folia sæpissime brevioribus hujus ramulis maxime divaricatis fulvo-pubescentibus, pedicellis abbreviatis, calycis lobis lanceolato-oblongis obtusis puberulis, corollæ alte partitæ lobis late oblongis obtusis quam calycis lobi duplo longioribus, coronæ phyllis gynostegio insigniter brevioribus subulatis paullulum incurvis, stylo bene exserto apice transversim sulcato.

Hab. Island of Buvúma, Lake Victoria Nyanza. Fl. March, 646.

Folia 1·5–2·0 cm. long., 0·7–0·8 cm. lat.; costæ supra planæ, subtus paullo eminentes; petioli 0·1 cm. long. Cymæ circa 1·0–2·0 cm. diam., ejus ramuli divaricantes sæpissime circiter 0·5 cm. long. Bracteæ ovato-oblongæ, 0·08 cm. long. Flores ex schedis lutescentes. Calycis lobi fere 1·0 cm. long. Corollæ lobi 0·2 cm. long.; tubus 0·05 cm. long. Gynostegium 0·1 cm., coronæ phylla 0·03 cm. long. Stylus quam gynostegium 0·03 cm. longior.

Near the last, but with subsessile leaves rotundate at base, quite different inflorescences, corollas with longer and relatively more deeply divided lobes and exserted styles.

SCHIZOGLOSSUM PETHERICKIANUM, *Oliver, in Trans. Linn. Soc.* xxix. (1873) 109; var. CORDATA, var. nov. A typo differt ob folia latiora basi cordata, cymas pedicellatas, flores paullo majores, calycis lacinias longiores (0·8 cm. long.), coronæ phylla gynostegio fere æquilonga.

Irunga. Fl. November, 394 B.

Distrib. (of type). Central Lake District.

Possibly a distinct species.

ASCLEPIAS GLAUCOPHYLLA, *Schlechter, in Journ. Bot.* xxxiv. (1896) 455.

Hillside, Mulema. Fl. & Fr. April, 231.

Distrib. Mozambique District (Rhodesia). Also in South Africa.

A. DENTICULATA, *Schlechter, in Journ. Bot.* xxxiii. (1895) 334.

Near the Rufúa. Fl. December, 517.

Distrib. Nile Land, South Central, Lower Guinea.

A. PHILLIPSIÆ, *N. E. Br. in Kew Bull.* (1895) 219.

Below Ruchigga, 5,600 ft. Fl. December, 522.

Distrib. Nile Land, Mozambique District (Usambara).

A. MACRANTHA, *Hochst. in Flora*, xxvii. (1844) 101.

Hillside at Mulema. Fl. April, 249.

Distrib. Nile Land, Mozambique District.

PENTARRHINUM INSIPIDUM, *E. Mey. Comm.* 200.

Near Mulema. Fl. April, 220.

Native name "Ukobobo." "Leaves boiled and taken as a medicine for fever."

Distrib. Nile Land, Mozambique District, Lower Guinea.

SARCOSTEMMA VIMINALE, *R. Br. in Mem. Wern. Soc.* i. (1809) 51.

Near Mulema and near Kikobe. Fl. March, May, 183, 302.

Native names "Kiyengeyenge" and "Kakonya." "The plant is eaten raw by women with babies if they lose their milk, in the belief that this will bring it back."

Distrib. Nile Land, Mozambique, Upper and Lower Guinea.

DÆMIA EXTENSA, *R. Br. in Mem. Wern. Soc.* i. (1809) 50.

Kagera Valley, near Mulema. Fl. May, 288.

Widely distributed through the Old World tropics.

CYNANCHUM ABYSSINICUM, *Decne. in DC. Prod.* viii. 548; var. TOMENTOSUM, *Oliver.*

Ruchigga. Fl. November, 437.

Distrib. Nile Land, Mozambique District (Northern part).

TYLOPHORA CONSPICUA, *N. E. Br. in Kew Bull.* (1895) 258.

Mutunda, on shore of Lake Victoria Nyanza. Fl. March, 580.

Distrib. Upper and Lower Guinea.

MARSDENIA ANGOLENSIS, *N. E. Br. in Kew Bull.* (1895) 258.

Island of Buvúma. Fl. March, 644.

Distrib. Lower Guinea.

CEROPEGIA TENUISSIMA, sp. nov.

C. caule volubili aliquanto complanato gracili glabro, foliis sessilibus angustissime linearibus acutis crassiusculis glabris, cymis axillaribus subsessilibus sessilibusve paucifloris, floribus parvis pedicellatis glabris viridibus, calycis lobis lineari-lanceolatis acutis, corollis rectis adusque $\frac{1}{2}$ divisis tubo deorsum inflato sursum constricto intus glabro lobis apice connatis anguste linearibus, corona exteriori cupulari ore dentato coronæ interioris phyllis ligulatis erectis gynostegium longe excedentibus.

Hab. Near Mulema. Fl. April, 254.

Folia adusque 5·0 cm. long., sæpe vero breviora, circa 0·1

cm. lat. Pedicelli 0·2–0·5 cm. long., glabri. Bracteæ subulatæ, summum 0·2 cm. long. Calycis lobi 0·3–0·45 cm. long. Corollæ tubus humectatus 1·2 cm. long., inferne 0·4 cm. superne vix 0·2 cm. lat.; lobi 1·1 cm. long., basi 0·12 cm. lat., superne undulati et 0·05 cm. lat. Corona exterior 0·04 cm., phylla interiora 0·17 cm. long.

Habit much that of *C. debilis*, N. E. Br., but flowers quite different.

TENARIS ROSTRATA, *N. E. Br. in Gard. Chron.* N. S. xxiv. (1885) 39.

Hillside, Mulema and at Ruchigga. Fl. May, November, 272, 435.

Distrib. Mozambique District.

LOGANIACEÆ.

NUXIA CONGESTA, *R. Br. ex Fresen. in Flora*, xxi. (1838) 606.

Irunga and Ruchigga. Fl. November, December, 392 & 465.

Distrib. Nile Land, Mozambique District, Upper Guinea.

ANTHOCLEISTA INERMIS, *Engler, in Engler, Jahrb.* xvii. (1896) 579.

Hillside, Musozi. Fl. & Fr. January, 122.

Distrib. Lower Guinea.

A. INSULANA, sp. nov.

Arbor inermis, glabra, foliis oblanceolato-obovatis apice rotundatissimis basi in petiolum brevem longissime attenuatis ibique breviter auriculatis auriculis inter se liberis margine subobsolete crenulatis chartaceis castaneis subtus pallidioribus costa media utrinque eminente costis secundariis circa 12 distantibus haud parallelis subtus prominentioribus costulis fere evanidis aperte reticulatis, inflorescentia pauciflora quam folia multo breviore dichasiis bis divisis horum ramis ancipitibus transversim rugosis, pedicellis quam calyces longioribus vel brevioribus, bracteis ——, alabastris anguste conicis, calycis lobis latissimis integris interioribus exteriores paullulum superantibus, corollæ albæ tubo sursum gradatim dilatato calycem plus quam duplo excedente crasso lobis 10–12 lineari-oblanceolatis quam tubus paullo longioribus, antheris filamentorum tubum excedentibus, stylo incluso, stigma subcapitato breviter bifido, bacca ovidea 4-loculari.

Hab. Buvúma Island, Lake Victoria Nyanza. Fl. March, 638.

Folia ultima 20·0–27·0 cm. long., 7·0–10·0 cm. lat., juxta basin adusque 0·5 cm. gradatim imminuta; petioli circa 3·0 cm. long.; auriculæ summum 0·5 cm. lat. Inflorescentia circa 12·0 cm. long. Pedunculi 0·5–1·5 cm. long. Calyx 0·8 cm. diam.; lobi exteriores 0·9 cm., interiores 1·0 cm. long. Alabastra 0·6 cm. diam. Corollæ tubus 2·2 cm. long., basi 0·5 cm. faucibus 1·1 cm. lat.; lobi 2·5 cm. long., 0·6 cm. lat. Filamentorum tubus 0·4 cm. antheræ 0·7 cm. long. Stylus 2·0 cm. long. Stigma 0·3 cm. diam. Bacca 2·0 cm. long., 1·5 cm. diam.

I have been unable to allocate this to any of the rather numerous species already described. The chief points by which it may be recognised are the absence of spines, the leaves narrowing into the petiole for a considerable part of their length, the few non-parallel lateral nerves of those organs, the short inflorescence, the longish corolla-tube exceeded in length by the 10–12 linear-oblanceolate lobes, and the short style.

GENTIANEÆ.

PARASIA GRANDIS, *Hiern, Welw. Cat.* i. 707.

Hill near the Rufúa. Fl. January, 549.

Distrib. Nile Land, Mozambique District, Lower Guinea. Also South Africa.

BORRAGINEÆ.

EHRETIA ANGOLENSIS, *Baker, in Kew Bull.* (1894) 29.

Irunga. Fl. November, 386.

Distrib. Lower Guinea.

CYNOGLOSSUM MICRANTHUM, *Desf. Tabl.* ed. I. 220.

Near Mulema. Fl. & Fr. June, 359.

Distrib. Occurs throughout Tropical Africa. Also in South Africa and Asia.

C. LANCEOLATUM, *Forsk. Fl. Ægypt.-Arab.* 41.

Ruchigga, where it is common on ground which has gone out of cultivation. Fl. November, 431.

Distrib. Nile Land, Mozambique, Lower Guinea. Also Cape and Arabia and India.

SOLANACEÆ.

SOLANUM HASTIFOLIUM, *Hochst. ex Dunal, in DC. Prod.* xiii. I. 284.
Kagera Valley near Mulema. Fl. & Fr. May, 280.
"Roots given to babies to stop their crying."
Distrib. Nile Land.

S. NAKURENSE, *C. H. Wright, in Kew Bull.* (1897) 275.
Ruchigga and Mbazi. Fl. March, November, 432 & 573. Flowers white.
Distrib. Central Lake District.

DISCOPODIUM PENNINERVIUM, *Hochst. in Flora*, xxvii. (1844) 22.
Ruchigga. Fl. December, 467.
Distrib. Nile Land.

PHYSALOIDES SOMNIFERA, *Moench, Meth.* 473.
Near Rufúa River. Fl. December, 539.
Distributed widely through the Old World.

CONVOLVULACEÆ.

(By A. B. RENDLE, D.Sc., F.L.S.)

IPOMŒA WIGHTII, *Choisy, in DC. Prod.* ix. 364.
Near Mulema. Fl. June, 362.
"Twining plant with red flowers."
Distrib. East Tropical Africa from Uganda to Rhodesia. Also in South Africa, Madagascar, and Tropical Asia.

I. INVOLUCRATA, *Beauv. Fl. Owar.* ii. 52, t. 89.
Ruchigga, 7000 ft. "Twining plant with violet-pink flowers." Fl. December, 527. Musozi. Fl. December, 9.
Distrib. Common in Tropical Africa.

I. PALMATA, *Forsk. Fl. Ægypt.-Arab.* 43.
Lake shore, Musozi. Fl. December, 15.
Distrib. Common in Tropical Africa and throughout the tropics.

LEPISTEMON AFRICANUM, *Oliver, in Hook. Icon.* t. 1270.
Uganda, coast of Victoria Nyanza. Fl. February, 569.
Distrib. Widely spread in Tropical Africa.

HEWITTIA BICOLOR, *Wight & Arn. in Madr. Journ. Lit. & Sci.* v. (1837) 22.

Mouth of Kagera River. Fl. December, 31.

Distrib. Widely spread in Tropical Africa. Also in Natal and Tropical Asia.

EVOLVULUS ALSINOIDES, *Linn. Sp. Pl.* ed. II. 392.

Roadside, Mulema. Fl. May, 318.

Native name "Namugioruk."

Distrib. A common tropical weed.

SCROPHULARINEÆ.

CELSIA BREVIPEDICELLATA, *Engl. Hochgebirgsfl. Trop. Afr.* 376.

Ruchigga. Fl. November, 409.

Distrib. Nile Land (South-east).

DOPATRIUM DORTMANNA, sp. nov.

D. glabrum, caule gracili elato simplici, foliis radicalibus parvulis oblongo-ovatis obtusis sessilibus, foliis caulinis minimis ovatis obtusis per paria distantia insertis, floribus stricte racemosis breviter pedicellatis, calycis parvi campanulati lobis brevibus late oblongis obtusis, corollæ tubo anguste cylindrico quam calyx triplo longiore sub limbo paullulum dilatato necnon curvato limbi labiis late ovatis labio antico quam posticum integrum 2½-plo longiore, antherarum loculis inter se æqualibus ciliolatis.

Hab. In tufts in water at the edge of a pool on the roadside at Mulema. Fl. May, 315.

Planta 20·0 cm. alt. Folia radicalia circa 0·7 cm. long. et 0·3 cm. lat.; caulina 0·15 cm. long. Internodia sæpissime 2·0–4·0 cm. long. Flores cyanei. Pedicelli florum profecto evolutorum 0·5–0·6 cm. long. Calyx totus 0·35 cm., lobi 0·13 cm. long. Corollæ tubus 1·2 cm. long., 0·12 cm. diam. Labium posticum 0·25 × 0·3 cm.; antici lobus intermedius 0·6 × 0·4 cm., lobi laterales 0·3 cm. long. Ovarium ovoideum, vix 0·2 cm. long. Stylus 1·0 cm. long.

Differs from *D. senegalense*, Benth., which it greatly resembles in habit, *inter alia* in the strictly racemose inflorescence, the larger calyx, and narrowly cylindrical corolla-tube. In this latter character it matches *D. stachytarphetoides*, Engl. & Gilg, which, however, is a plant of coarser growth with much larger radical leaves, a paniculate inflorescence, and the calyx and corolla in several respects different.

CRATEROSTIGMA PLANTAGINEUM, *Hochst. in Flora*, xxiv. (1841) 669.

Near the Rufúa. Fl. December, 519.

Distrib. Nile Land, Mozambique, Lower Guinea. Also in South Africa.

ILYSANTHES ANDONGENSIS, *Hiern, Welw. Cat.* i. 765.

Near the Rufúa, growing in short turf on rock with *Craterostigma plantagineum*, Hochst. Fl. December, 519 A.

Distrib. Lower Guinea.

BUCHNERA PULCHRA, *Skan, MSS. in Herb. Kew.*; caule robusto erecto sursum parum ramoso fere a basi folioso scabride pubescente demum scabro, foliis sessilibus oblongis vel oblongo-lanceolatis obtusis trinervibus scaberrimis, spicis multifloris subglobosis, bracteis oblongis superne angustatis calycem æquantibus, bracteolis linearibus sursum maxime attenuatis a bracteis bene superatis ut bracteæ et calyces hispide pubescentibus, calycis 10-nervosi lobis lineari-subulatis quam tubus 3-plo brevioribus, corollæ tubo recto calycem paullo excedente limbi lobis amplis anguste obovatis.

Hab. Ruchigga. Fl. December, 402.

Planta fere metralis (85 cm. alt.). Folia inferiora 4·0–5·0 cm. × 0·9–1·1 cm., superiora 3·0–4·0 cm. × 0·5–0·7 cm. Spicæ 1·5–2·2 cm. long., circa 1·5 cm. lat. Bracteæ 1·0 cm., bracteolæ 0·75 cm. long. Calyx totus vix 1·0 cm. long, ima basi 0·15. cm. superne 0·22 cm. lat.; lobi 0·25 cm. long. Corollæ tubus longitrorsum eminenter 5-striatus, 1·2 cm. long., faucibus 0·3 cm. diam.; lobi 0·6 cm. long. Ovarium anguste ovoideum, glabrum, 0·12 cm. long. Capsula ——.

Known *inter alia* by the globose spikes with bracts equalling the calyx in length and bracteoles somewhat smaller.

STRIGA ELEGANS, *Benth. in Comp. Bot. Mag.* i. (1835) 363.

Below Ruchigga, at 5000 ft. Fl. December, 495.

Distrib. Nile Land, Mozambique District, Lower Guinea. Also in South Africa.

STRIGA CANESCENS, *Engler*, *Pflanzenwelt Ost-Afr.* C. 361.

Near Mulema and at Irunga. Fl. June, November, 330 & 394 C.

Distrib. Nile Land, Mozambique District, Upper and Lower Guinea.

RHAMPHICARPA HEUGLINII, *Hochst. ex Schweinf. Beitr. Fl. Æthiop.* 100.

Mulema. Fl. April, 230.

Distrib. Nile Land.

CYCNIUM ADOENSE, *E. Mey. ex Benth. in Comp. Bot. Mag.* i. (1835) 363.

Hillside at Mulema. Fl. April, 229.

Distrib. Mozambique District, Lower Guinea. Also in South Africa.

SOPUBEA RAMOSA, *Hochst. in Flora*, xxvii. (1844) 27.

Mulema and Ruchigga. Fl. April, December, 240 & 529 A.

Distrib. Nile Land, Mozambique District, Upper and Lower Guinea.

S. KARAGUENSIS, *Oliver, in Trans. Linn. Soc.* xxix. (1873) 123.

Kagera Valley near Mulema. Fl. May, 298.

Native name "Nyakocha." "The leaves are eaten for syphilis."

Distrib. Central Lake District.

S. CONFERTA, sp. nov.

S. stricta, caulibus simplicibus angularibus inter angulas breviter griseo-villosulo-tomentosis mox glabris, foliis confertis quasiverticillatis anguste linearibus acutis chartaceis primo aliquantulum araneosis cito glabris, floribus sessilibus in spica densa terminali late oblonga dispositis, bracteis lineari-lanceolatis acutis quam alabastra subsphæroidea longioribus margine dense villoso-lanatis, calycis dense lanati lobis triangulari-deltoideis acutis quam tubus paullulum brevioribus, corollæ mediocris lobis ovatis tubo brevioribus, antheris per paria cohærentibus, capsula ovoidea sursum compressa apice rostrata.

Hab. Ruchigga, 6500–7000 feet. Fl. December, 529.

Planta fere adusque 40·0 cm. alt. Folia 1·5–2·0 cm. long., et 0·1–0·15 cm. lat., patula. Spica maxima nondum omnino evoluta 5·0 cm. long. Bracteæ circa 1·0 cm. long.

et 0·25 cm. lat. Calycis tubus 0·4 cm. long., circa 0·5 cm. diam.; lobi 0·3 cm. long. Corollæ dilute puniceæ; tubus leviter curvatus, 0·7 cm. long., 0·2 cm. lat. Antheræ 0·3 cm. long. Capsula 0·45 cm. long., 0·3 cm. lat., glabra.

A very distinct species, recognized at once by its narrow crowded leaves together with the very dense spikes of sessile flowers.

SOPUBEA UGANDENSIS, sp. nov.

S. caulibus strictis validis deorsum simplicibus sursum ramosis e radice sat robusto oriundis, ramulis creberrime foliosis patentibus, foliis quasiverticillatis sessilibus circa adusque medium trifidis raro bifidis integrisve uti segmenta anguste linearibus obtusiusculis margine involutis scabridis, floribus sessilibus in spica densa terminali cylindrica dispositis, bracteis inferne dilatatis et concavis superne trifidis summis integris flores longe excedentibus segmentis linearibus, bracteolis ovato-spathulatis obtusis juxta medium subito ampliatis igitur unguiculatis, calycis lobis ovato-lanceolatis acuminatis ciliatis quam tubus superne transversim rugulatus longioribus, antheris mox liberis, capsula ovoidea apice compressiuscula retusa.

Hab. Below Ruchigga. Fl. December, 502.

Planta fere 30·0 cm. alt. Caules 0·3–0·4 cm. diam., subteretes, secus lineas latas pubescentes ceterum glabri. Ramuli absque inflorescentia usque ad 5·0 cm. long. Folia ima basi paullulum dilatata, modice 1·0–2·0 cm. long.; segmenta 0·5–1·5 cm. long., vix 0·1 cm. lat. Spicæ complete evolutæ, 5·0 cm. long., 1·5 cm. diam. Bracteæ circa 1·0 cm. long., inferne 0·45 cm. lat.; harum segmenta 0·1 cm. lat., ± 0·7 cm. long. Bracteolæ 0·6 cm. long.; unguis 0·1 cm., lamina 0·3 cm. lat. Flores rubri. Calycis tubus circa 0·4 cm., lobi 0·5 cm. long. Corollæ tubus sursum leviter et gradatim dilatatus, 0·6 cm. long.; lobi latissime obovati, 0·4 cm. long. Antheræ 0·2 cm. long. Capsula vix 0·5 cm. long., 0·4 cm. lat.; valvæ integræ. Semina oblonga vel anguste ovoidea, truncata, microscopice scrobiculata, fusca.

Near the last, with which it shares the peculiarity of densely massed sessile flowers, but the two are altogether different in leaf and flower.

OROBANCHEÆ.

OROBANCHE MINOR, *Sutt. in Trans. Linn. Soc.* iv. (1798) 179.

Ruchigga, on ground gone out of cultivation. Fl. December, 477.

Parasitic on the roots of *Crassocephalum diversifolium* var. *crepidioides*.

Distrib. Nile Land, Mozambique. Also Europe, &c.

BIGNONIACEÆ.

SPATHODEA CAMPANULATA, *Beauv. Fl. Owar.* i. 47.

Buvúma Island. Fl. March, 625.

Distrib. Nile Land, Mozambique District, South Central, Upper and Lower Guinea.

PEDALINEÆ.

SESAMUM CALYCINUM, *Welw. in Trans. Linn. Soc.* xxvii. (1873) 52.

Kagera Valley near Mulema. Fl. & Fr. May, 300.

Distrib. Nile Land, Mozambique District, Lower Guinea.

ACANTHACEÆ.

THUNBERGIA ALATA, *Boj. ex Sims, in Bot. Mag.* sub t. 2591.

Mouth of the Kagera, and Ruchigga at 7000 feet. Fl. December, 22, 23, 526.

Widely distributed in Tropical Africa, also in Natal.

Var. VIXALATA, *Burkill, in Dyer, Fl. Trop. Afr.* v. 16.

Near Mulema. Fl. & Fr. June, 343.

Distrib. Nile Land, Mozambique District.

ACANTHOPALE DECEMPEDALIS, *C. B. Clarke, in Dyer, Fl. Trop. Afr.* v. 63.

In forest near mouth of the Kagera. Fl. February, 557.

Distrib. Upper Guinea.

WHITFIELDIA TANGANYIKENSIS, *C. B. Clarke, in Dyer, Fl. Trop. Afr.* v. 67.

Mulema and Buvúma Island. Fl. March, April, 203 & 622.

Distrib. Central Lake District.

DYSCHORISTE TRICHOCALYX, *Lindau, in Engler, Pflanzenwelt Ost-Afr.* C. 367.

Below Ruchigga. Fl. & Fr. December, 503.

Distrib. Central Lake District.

CHÆTACANTHUS PERSOONII, *Nees, in Linnæa*, xvi. (1841) 347.

Hill near Rufúa. Fl. January, 547.

Distrib. A South-African plant.

BLEPHARIS CRISTATA, sp. nov.

B. suffruticosa, a basi ramosa ramis ascendentibus sat tenuibus bene foliosis pubescenti-hispidis, foliis in pseudoverticillis 4-natis dispositis quoque in pseudoverticillo sæpissime inæqualibus sc. 2 minoribus lineari-lanceolatis obtuse acutis sessilibus margine paucispinosis rarius integris vel basin versus breviter lobulatis firme membranaceis utrinque pilis appressis strigosis munitis, floribus mediocribus in capitulis pedunculatis plurifloris dispositis, bracteis sterilibus inter se inæqualibus anguste lineari-lanceolatis margine spinoso-paucidentatis, bractea fertili oblonga una cum bracteolis æquilongis vel subæquilongis latioribus apice 2–3-lobis spinose acuminata necnon margine rarispinosa, calycis pilosi lobis anticis postico æquilongis late oblongis alte coalitis postico oblongo-ovato apice breviter 2–3-spinoso lobis lateralibus anguste lineari-lanceolatis quam reliqui parum brevioribus spinoso-acuminatis, corollis ex scheda cl. detectoris cæruleis limbo 3-lobo scabride pubescente, antheris stricte unilocularibus.

Hab. Near the Rufúa. Fl. December, 506.

Planta usque ad 40·0 cm. alt. Folia 2·0–4·0 cm. long., 0·6–1·0 cm. lat., spina abbreviata terminata; costa media fac. inf. valde prominens. Bracteæ steriles longiores 2·5 × 0·3–0·4 cm., paucissime extimæ adusque 0·5 cm. lat.; bracteæ minimæ 0·5 cm. long., vel paullo ultra. Bracteolæ 1·2 × 0·2–0·25 cm. Calycis lobus anticus 2-nervis, 1·7 × 0·5 cm., hujus partes liberæ 0·4 cm. long.; lobus posticus usque ad 0·6 cm. lat.; lobi laterales 1·5 × 0·25 cm. Corollæ in toto 2·6 cm. long.; tubus ovoideus, 0·65 cm. long.; limbus quadrato-spathulatus, superne 1·0 cm. lat. Stamina 1·0 cm. long.; antheræ majores 0·5 cm. long. Capsula ——.

Distinguished *inter alia* by its hispid branches, relatively short

leaves with few or no spines, narrow outer bracts, and equally long anticous and posticous calyx-lobes.

SCLEROCHITON HOLSTII, *C. B. Clarke, in Dyer, Fl. Trop. Afr.* v. 111.

In damp sandy soil by side of Lake Victoria Nyanza at Musozi. Fl. January, 81.

Distrib. Mozambique District.

CROSSANDRA GUINEENSIS, *Nees, in DC. Prod.* xi. 281.

Near mouth of the Kagera. Fl. February, 554.

Distrib. Upper and Lower Guinea.

STYASASIA: Acanthacearum e tribu Justiciearum genus novum. (Pl. 2.)

Calyx 5-partitus, lobis angustis inter se æqualibus. Corollæ tubus mediocriter elongatus, superne paullulum amplificatus; limbus 2-labiatus, labio antico 3-lobo quam posticum bifidum parum breviore. Stamina 4, didynama, subinclusa, supra medium tubum inserta; filamenta basi dilatata ibique brevissime per paria connata; antheræ 2-loculares, loculis inter se æqualibus basi mucronulatis alio paullo altius affixo. Pollinis grana iis *Asystasiæ* similia (Rahmenpollen). Stylus apice obtusus. Ovula quoque in loculo 2. Capsula anguste ovoidea, inferne in stipitem cylindricum contracta. Semina 2–4, complanata, suborbiculata, eximie rugosa.—Folia normalia. Flores breviter pedicellati, in panicula terminali thyrsoidea digesti. Bracteæ bracteolæque parvæ.

S. AFRICANA, sp. unica. (*Isochoriste africana*, S. Moore, in Journ. Bot. xviii. (1880) 309. *Asystasia africana*, C. B. Clarke, in Dyer, Fl. Trop. Afr. v. 134.)

Angola: *Welwitsch*, 5073, 5078, 5079.

Var. PARVIFLORA, var. nov. Corollæ summum 1·3 cm. long.; harum tubus 0·6 cm., labium posticum 0·7 cm., necnon lobum anticum 0·55 cm. long.

Hab. Shore of Lake Victoria Nyanza at Musozi. Fl. January, 54.

Welwitsch noted the type as "herba 2–3-pedalis," whereas Dr. Bagshawe describes the var. *parviflora* as "a straggling shrub." In spite of this difference in habit, except for difference in size of the flowers, the two seem to agree absolutely.

According to Dr. Bagshawe, the flowers of the variety are white with red streaks on the mid-lobe of the lower lip.

The genus here proposed is evidently closely allied to *Asystasia*, from which it differs in the 2-lipped corolla. This being the alleged difference between *Asystasia* and *Isochoriste*, Miq., I was led, when writing my memoir on Welwitsch's *Acanthaceæ* (Journ. Bot. xviii. (1880) *passim*), to include Welwitsch's specimens in the latter genus. Mr. Clarke, however, has recently had an opportunity of examining the material upon which Miquel's genus was founded, and he finds *I. javanica*, Miq., to be only a well-known species of *Asystasia*. That the plant here dealt with cannot, with its strongly bilabiate corolla, be included in *Asystasia* is a point I have always maintained, and it gives me pleasure to add that Mr. Clarke now shares this view. Under these circumstances a new generic definition and term are required for *Isochoriste africana*.

BARLERIA OPACA, *Nees, in DC. Prod.* xi. 230.
Kagera Valley near Mulema. Fl. May, 279.
Distrib. Upper Guinea.

PSEUDERANTHEMUM LUDOVICIANUM, *Büttn. in Verh. Bot. Brand.* xxxii. (1890) 41.
Buvúma Island. Fl. March, 632.
Distrib. Upper Guinea, South Central.

JUSTICIA FLAVA, *Vahl, Symb.* ii. 15.
Shore of Lake at Musozi. Fl. December, 16.
Distrib. Nile Land, Mozambique District, Upper and Lower Guinea.

J. LEPTOCARPA, *Lindau, in Engl. Jahrb.* xx. (1894) 70.
Below Ruchigga, at 5000 ft. Fl. December, 494.
Distrib. Nile Land, Mozambique District.

VERBENACEÆ.

LANTANA SALVIFOLIA, *Jacq. Hort. Schœnb.* iii. 18.
Near Mulema. Fl. May, 320.
Distributed through Tropical Africa, S. Africa, and India.

PREMNA MELANOPHYLLA, sp. nov.

P. ramulis divaricatis ultimis foliosis minute fulvo-pubescentibus mox glabris, foliis oppositis petiolatis ovatis vel ovato-oblongis acutis interdum brevissime cuspidulatis basi

obtusis integris pilis paucis strigosis appressis exemptis glabris in sicco nigrescentibus, cymis in paniculo angusto sed patulo bracteato sat brevi fulvo-pubescente dispositis, floribus pedicellis calycem sæpissime excedentibus insidentibus, calycis anguste campanulati pubescentis adusque ½-partiti lobis deltoideo-oblongis vel deltoideis acutis, corollæ tubo angusto calycem circa duplo excedente, limbo 5-lobo lobis inter se subæqualibus subpatentibus, staminibus longe exsertis.

Hab. In a swamp at the mouth of the Bakore. Fl. January, 141 A.

Foliorum lamina 3·0–4·5 cm. long., 2·0–3·5 cm. lat.; costulæ utrinque circa 6, apertissime arcuatæ, supra impressæ subtus prominentes; petioli summum 2·0 cm. long., sæpius vero breviores, microscopice puberuli. Paniculi nondum profecto evoluti 5·0 cm. long.; horum ramuli ad angulum rectum vel fere rectum rhachi affixi; bracteæ infimæ foliis summis similes sed paullo majores, reliquæ imminutæ, lanceolatæ, ± 0·5 cm. long. Pedicelli ± 0·3 cm. long. Calyx totus 0·22 cm., corollæ tubus 0·43 cm. long., hic vix 0·1 cm. lat., extus minute pubescens; corollæ limbus 0·35 cm. diam., lobi 0·15 cm. long. Stamina ad 0·5 cm. exserta. Ovarium globosum. Fructus ——.

Apparently nearest *P. macrosiphon*, Baker, but with quite different leaves among other characters.

SIPHONANTHUS (§ Clerodendron) **NUXIOIDES**, sp. nov.

Frutex ramosus, crebro foliosus, foliis obovato-oblongis apice cuspidatis obtusis inferne in petiolum sat longum sensim attenuatis membranaceis glabris costis secundariis utrinque circa 6 interjectis pluribus aliis ord. inf. brevibus, floribus parvis in cymis pedunculatis terminalibus laxis minutissime pubescentibus foliis sæpe æquilongis dispositis, cymulis pseudumbellatis paucifloris, pedicellis quam calyx brevioribus, calyce tubuloso-campanulato puberulo breviter 5-lobo lobis deltoideis acutis, corollæ tubo recto gracillimo calycem duplo excedente lobis brevibus obovatis obtusissimis.

Hab. Uganda, coast of Lake Victoria Nyanza at Mutunda. Fl. March, 579.

Folia subnitida, solemniter 8·0–10·0 cm. long., summum

4·0–5·0 cm. lat., ima basi ad 0·6 cm. coartata; nervulæ delicatulæ, utrinque perspicuæ, eleganter reticulatæ; petioli 0·7–2·5 cm. long. Cymæ 5·0–9·0 cm. long., earum ramuli cymuligeri patentes, ± 1·0 cm. long. Bracteæ angustissime lineares, 0·17 cm. long. Pedicelli circa 0·2 cm. long. Flores albi. Calycis humectati tubus 0·35 cm. long., 0·25 cm. lat.; lobi 0·13 cm. long. Corollæ tubus 1·0 cm. long., ima basi 0·12 cm., sursum vix 0·1 cm., faucibus ipsis fere 0·2 cm. diam.; lobi vix 0·3 cm. long. Antheræ ad 0·6 cm. exsertæ.

Nearest *Clerodendron Preussii*, Gürke, and *Cl. yaundense*, Gürke, from both of which it differs in the leaves narrowed below into the petiole, and in several floral details.

SIPHONANTHUS CAPITATA, *S. Moore.* (Clerodendron capitatum, *Schum. & Thonn. in K. Dansk. Vid. Selsk. Afh.* iv. 61.)
Musozi and Buvúma Island. Fl. February, March, 152 & 617.
Distrib. Nile Land, Mozambique District, Upper Guinea, South Central.

S. ROTUNDIFOLIA, *S. Moore.* (Clerodendron rotundifolium, *Oliver, in Trans. Linn. Soc.* xxix. (1873) 132.)
Near Mulema. Fl. June, 345.
Distrib. Central Lake District.

S. MYRICOIDES, *Hiern, Welw. Cat.* i. 844.
In a gorge at Mulema, also River Rufúa. Fl. April, December, 260 & 540. Native name "Muzainanya."
Distributed widely in Tropical Africa.

VITEX FISCHERI, *Gürke, in Engl. Jahrb.* xviii. (1893) 171.
Musozi. Fl. January, 45.
Distrib. Central Lake District.

LABIATÆ.

OCIMUM SUAVE, *Willd. Enum. Hort. Berol.* 629.
Musozi. Fl. January, 113.
Native name "Mujaja." "The leaves are mixed with water and the infusion drunk for pains in the abdomen."
Distrib. Nile Land, Mozambique, Lower Guinea. Also Tropical Asia.

A rather remarkable form with long-stalked leaves, which are almost glabrous on both faces and strongly toothed along the margin. I was at first inclined to regard this as *O. americanum*, Mill., but further examination has led me to adopt Mr. Britten's suggestion that the plant would better be referred to *O. suave.*

GENIOSPORUM PALUDOSUM, *Baker, in Dyer, Fl. Trop. Afr.* v. 352.
Ruchigga. Fl. December, 481.
Distrib. Nile Land, Mozambique District.

MOSCHOSMA RIPARIUM, *Hochst. in Flora*, xxviii. (1845) 67.
Hillside, Musozi. Fl. January, 97.
Distrib. Nile Land, Mozambique District, Lower Guinea.

ORTHOSIPHON (§ Virgati) VIATORUM, sp. nov.

Herba erecta fere a basi ramosa ramis ascendentibus foliosis glabrescentibus, foliis parvis oblongo-ovatis obtusis vel obtuse acutis serratis basi in petiolum brevem cuneatim angustatis scabriusculis, racemis ramis æquilongis puberulis, verticillastris 6- (raro 5- vel 7-) floris, bracteis ovatis acuminatis parvis sed cito majoribus et reflexis persistentibus, pedicellis quam calyx fere duplo brevioribus pubescentibus, calycis florescentis strigoso-puberuli lobo postico rubescente rotundato-ovato obtusissimo lobis reliquis lanceolatis lateralibus breviter anticis longe setaceo-acuminatis, calyce fructificanto paullulum solummodo aucto recurvo, corollæ tubo breviter exserto labio antico late ovato quam posticum 4-lobum breviore, staminibus inclusis.

Hab. Roadside at Mulema. Fl. June, 327.

Folia circa 2·0 × 1·0 cm., in sicco olivacea, costis subtus prominentibus; petioli 0·2–0·4 cm. long. Racemi saltem 8·0 cm. long. Bracteæ sub alabastris circa 0·2 cm. long., mox adusque 0·35 cm. amplificatæ. Flores dilute punicei (sec. cl. collectorem). Pedicelli summum 0·3 cm. long. Calycis florescentis 0·5 cm. long. lobus posticus 0·2 × 0·25 cm., lobi laterales 0·13 cm., antici 0·23 cm. long. Calyx fructescens 0·6 cm. long. (tubus fere 0·4 cm.). Corollæ tubus extus pubescens, 0·6 cm. long., 0·12 cm. diam.; labium anticum 0·2 cm. posticum 0·3 cm. long.

Apparently nearest *O. heterochrous*, Briq., an Angolan species known to me only by description, which has larger reddish leaves, deciduous bracts (shape and size not mentioned), violet

calyces with ferruginous clothing, &c. From other species to which it bears some resemblance it can easily be told by the small acuminate bracts crowded at the ends of the racemes.

PLECTRANTHUS UGANDENSIS, sp. nov.

P. herbaceus, elatus, ascendens, caule inferne valido necnon nudo superne ramoso et folioso piloso-pubescente, foliis parvis petiolatis late ovatis obtusis basi nunc rotundatis nunc truncatis nunc revera obtusis margine crenato-dentatis utrinque appresse piloso-pubescentibus dein puberulis aliquantulum crassiusculis, floribus in paniculis gracilibus sat effusis folia multoties excedentibus minute glanduloso-pubescentibus digestis, verticillastris distantibus 2- (raro 3-) floris, bracteis parvis lanceolatis quam pedicelli calyci subæquilongi multo brevioribus, calycis minute glanduloso-puberuli lobo postico sub flore ovato sursum attenuato quam lobi reliqui setacei paullulum breviore, corollæ tubo calycem duplo excedente sigmoideo labio antico late oblongo quam posticum oblongo-ovatum dentato-3-lobum obtusissimum paullo longiore.

Hab. Ruchigga at 7000 feet. Fl. December, 532.

Herba $\frac{2}{3}$-metralis. Folia 1·0–2·0 × 0·8–1·3 (rarissime 1·5) cm.; petioli ± 0·5 cm. long., ut folia pilis crassiusculis albidis piloso-pubescentes. Paniculus feri $\frac{1}{2}$-metralis; hujus rami simplices, ascendenti-patentes. Bracteæ modicæ 0·1–0·3 cm. long. Pedicelli sub flore 0·3 cm. sub fructu nutantes et 0·6–0·7 cm. long. Flores dilute cærulescentes. Calyx florescens 0·25 cm. long.; fructificans 0·7 cm. long.; hujus lobum posticum late ovatum acutum, 0·23 cm. long. et totidem lat.; lobi reliqui recti, firmi, laterales 0·2 cm. antici 0·26 cm. long. Corollæ tubus 0·5 cm. long., 0·1 cm. diam., extus puberulus; labium anticum 0·5 × 0·3 cm., posticum 0·4 × 0·375 cm., hujus lobi laterales vix 0·1 cm. long., obtusissimi. Nuculæ ovoideæ, leves, politæ, 0·1 cm. diam.

Recognisable by means of the small pilose-pubescent leaves, the long effuse panicles, and 2-flowered verticillasters, coupled with certain characters of the calyx and corolla.

COLEUS UMBROSUS, *Vatke, in Linnæa*, xliii. (1880) 91.

Ruchigga. Fl. November, 420.

Distrib. Nile Land. Mozambique District.

Pycnostachys ruwenzoriensis, *Baker, in Dyer, Fl. Trop. Afr.* v. 384.
Irunga. Fl. November, 382.
Distrib. Central Lake District.

Micromeria biflora, *Benth. Lab.* 378.
Ruchigga. Fl. November, 399.
Widely distributed in Tropical Africa. Also a South-African and Asian species.

Leucas orbicularis, *Gürke, in Engler, Pflanzenwelt Ost-Afr.* C. 343.
Below Ruchigga. Fl. December, 499.
Distrib. Central Lake District.

Leonotis nepetifolia, *R. Br. in Ait. Hort. Kew.* ed. II. iii. 409.
Mouth of the Kagera. Fl. December, 32.
Widely distributed through the tropics.

APETALÆ.

(By A. B. Rendle, D.Sc., F.L.S.)

Nyctagineæ.

Mirabilis Jalapa, *Linn. Sp. Pl.* 177.
Near Mulema. Fl. April, 224.
Distrib. A widely distributed tropical weed.

Boerhavia plumbaginea, *Cav. Icon.* ii. 7, t. 112. (B. dichotoma, *Vahl, Enum.* i. 290.)
Bank of Kagera near Mulema. Fl. June, 324.
Distrib. A widespread tropical and South-African plant.

Illecebraceæ.

Pollichia campestris, *Ait. Hort. Kew.* i. 5.
Hill near Rufúa. Fl. & Fr. January, 545.
Distrib. Tropical and South Africa.

Amarantaceæ.

Amarantus Blitum, *Linn. Sp. Pl.* 990.
Found everywhere. Fl. December, 493.
Distrib. A common tropical weed.

ACHYRANTHES ASPERA, *Linn. Sp. Pl.* 204.
Mulema, hillside. Fl. April, 242. Ruchigga. Fl November, 457.
Native name "Makwa."
Distrib. Widely spread in the tropics.

CYATHULA GLOBULIFERA, *Moq.-Tand. in DC. Prodr.* xiii. 2. 329.
Churezi. Fl. January, 101.
Distrib. Abyssinia, Nyassaland, Angola; also South Africa and Madagascar.

PUPALIA LAPPACEA, *Moq.-Tand. l. c.* 331.
Gorge above Mulema. Fl. April, 246.
Distrib. Tropical Africa; also in Tropical Asia.

PHYTOLACCACEÆ.

HILLERIA ELASTICA, *Vell. Fl. Flum.* 47.
Near mouth of Kagera. Fl. February, 556.
Distrib. West Tropical Africa (Guinea, Congo, Angola).

PHYTOLACCA DODECANDRA, *L'Hérit. Stirp. Nov.* 143.
Mulema. Fl. & Fr. June, 363.
Distrib. East and West Tropical Africa.

POLYGONACEÆ.

OXYGONUM CORDOFANUM, *Dammer, in Engler, Nat. Pflanzenfam.* iii. 1 *a*, 30.
Hill-top near Mulema. Fl. June, 337.
Distrib. Abyssinia, Nile Land; Angola.

POLYGONUM BARBATUM, *Linn. Sp. Pl.* 362.
Burumba. Fl. July, 373.
Distrib. East Tropical Africa, South Africa. Tropical Asia.

RUMEX ABYSSINICUS, *Jacq. Hort. Vindob.* iii. 48, t. 93.
Ruchigga. Fl. November, 448.
Distrib. East and West Tropical Africa.

Var. ANGUSTISECTUS, *Engler, in Hochgebirgsfl. Trop. Afr.* 203.
Near Mulema. Fl. June, 364.
Distrib. Abyssinia.

LAURACEÆ.

BEILSCHMIEDIA UGANDENSIS, sp. nov.

Frutex, virgis juvenissimis et paniculis exceptis, glabra; ramis adultis cortice cinereo instructis, ramulis foliaceis atro-brunneis; foliis ellipticis vel elliptico-oblongis, basi subangustatis, apice obsolete acuminatis; siccis subcoriaceis, supra nigrescentibus, nervis lateralibus, circ. 10–12, arcuatim patentibus, cum venis reticulatis, infra prominulis; petiolo brevi; panicula dimidium folii haud attingente, minutissime ferrugineo-pubescente, supra basin ramosa, ramis oppositis patentibus, iterum paniculatis, multifloris, bracteis caducis late ovatis, acuminatis, dense ferrugineo-pubescentibus; receptaculo late turbinato; perianthii segmentis late ovatis, apice incurvis, veluti receptaculo ferrugineo-pubescentibus; staminibus 6 exterioribus sub perianthii segmentis celatis, filamentis brevissimis, subtruncatis, velut staminibus interioribus similibus, staminodiisque subovoideis alternis, cum pilis brevibus tomentosis ferrugineis dense velatis; ovario ellipsoideo-ovoideo, glabro, basi pilis ferrugineis densis cincto; stylo subæquale.

Hab. Lake shore north of mouth of River Bakova. Fl. January, 142. "A shrub with greenish flowers in shady situation."

Rami ramulos foliaceos ferentes 6 mm. diam. Folia 9–16 cm. long., 5–8·5 cm. lat.; petioli 6–8 mm. long. Panicula ad 6 cm. long. et lat. Flores 2·5–3 cm. lat., pedicelli 2–3 mm. long. Perianthii 1 segmenta 1 mm. long. Stamina exteriora et interiora circa ·75 mm. long.; staminodia ·5 mm. long., breviter stipitata. Ovarium cum stylo 1·25 mm. long.

An interesting addition to the genus, which, though represented by several species in West tropical Africa, has not hitherto been known from the Eastern side. The species is quite distinct from the Western forms, recalling most nearly in foliage and inflorescence a species found by Zenker in the Cameroons (No. 2117, named, but apparently not yet published, by Dr. Engler); the flowers are, however, considerably larger. It also recalls a second Cameroon species, *B. fruticosa*, Engl., but the shape of stamens and staminodes is very different in the two.

PROTEACEÆ.

PROTEA MELLIODORA, *Engler & Gilg, in Baum, Kunen.-Samb. Exped.* 224.

Mulema and Ruchigga. Fl. November, 417.

Previously collected by Baum on the Longa River in the S.E. interior of Portuguese West Africa.

THYMELÆACEÆ.

LASIOSIPHON AFFINIS, *Kotschy & Peyr. Plant. Tinn.* 39, t. xix *b.*

Hillside, Burumba. Fl. & Fr. July, 372.

"Erect herb with yellow flowers."

Our specimens show slight differences from the type as described and figured, the leaves being larger (reaching 3·5 cm. long by 11 mm. broad) and less generally oblong. The bracts also are narrower and the flowers a little smaller. But without seeing a specimen of *L. affinis*, I do not feel justified in separating the Uganda plant.

Distrib. Bongo, Central Africa.

PEDDIEA LONGIFLORA, *Engler & Gilg, in Engler, Jahrb.* xxx. (1901) 257.

Musozi. Fl. January, 91.

Distrib. Togoland.

P. FISCHERI, *Engler, in Hochgebirgsfl. Trop. Afr.* 310.

Island of Buvúma, Victoria Nyanza. Fl. & Fr. March, 606.

Distrib. Masai highlands, between Victoria Nyanza and Lake Baringo.

LORANTHACEÆ.

LORANTHUS (§ Dendrophthoë) USUIENSIS, *Oliver, in Trans. Linn. Soc.* xxix. (1873) 80.

Near Mulema. Fl. June, 356.

"Red-flowered parasite."

Distrib. Uganda.

L. (§ Tapinanthus) MUSOZENSIS, sp. nov.

Planta ramulis novellis breviter tomentosis, adultis cum cortice cinereo haud conspicue lenticillato; foliis suboppositis crassiusculis, late ovatis, obtusis, basi subtruncate

rotundatis, e basi penninervatis, nervis lateralibus infra prominulis, utrinque stellato-pubescentibus; floribus breviter pedicellatis, in capitulis axillaribus paucifloris sessilibus aggregatis; bractea oblique ovata basin calyculi amplectente; calyculo cupulato ferrugine piloso, margine breviter dentato; perigonio cum pilis brevibus articulatis ramosis ferrugineis tomentoso, supra tubum subglobosum valde constricto, infundibuliforme, ultra medium unilateraliter fisso, apice, in alabastro, inflato cylindrico, laciniis lineari-oblanceolatis, haud reflexis, supra in facie interiore cum pariete rigida basi bene limitata instructis; antheris linearibus; stylo superne crassiusculo, pentagono, sub stigmate subgloboso angustato.

Hab. Musozi. Fl. January, 134.

"Parasitic on bark-cloth fig."

Internodia 2–3 cm. long. Folia 6–8 cm. long., 4·5–5 cm. lat.; petioli 1 cm. long. Pedicellus 4 mm. long. Bractea 3 mm. long. Calyculus 3 mm. long. Perianthium 4 cm. long.; parte inferiore inflato circa 4 mm. long. et lat., lobis vix 8 mm. long. Antheræ 3 mm. long.

Very nearly allied to the Angolan species *L. Molleri*, Engler, which was found by Welwitsch on an island in the River Quanza in Pungo Andongo. It differs in the slightly shorter limbs of the perianth, and especially in the broader, almost truncately based ovate leaves.

LORANTHUS (§ Tapinanthus) PITTOSPORÆ, sp. nov.

L. glabra, ramulis novellis nodosis oppositifoliis, atrobrunneis; adultis cortice cinereo cum lenticellis numerosis brunneo-punctulatis; foliis crassis ovato-lanceolatis vel ovatis, basi oblique rotundis, ad apicem subacutum angustatis, penninervatis, nervis lateralibus prominentibus, utrinquesæpius 3, interdum 2, ascendentibus, nec marginem attingentibus; floribus in capitulis plurifloris vix pedunculatis, axillaribus sessilibus; bracteis oblique cupuliformibus, margine integro ut in calyce obsolete ciliolato; calyculo tubuliforme infra medium cum ovario connato, demum supra longitudinaliter fisso; perigonii rubri, tubo basi globoso, anguste infundibulare, apice inflato ante anthesin, breviter ovoideo, obscurius pentagono, laciniis crassis, lineari-oblanceolatis, filamentis linearibus cum dente erecto breve obtuso sub antheris instructis; stylo et stigmate subsectionis.

Hab. Ruchigga. Fl. November, 445.

"Parasitic on *Pittosporum abyssinicum.*"

Internodia in ramis florentibus 2–3·5 mm. diam., 3–5 cm. long. Folia 8–12 cm. long., 3–4 cm. lat.; petioli vix 1 cm. long. Bracteæ circa 2 mm. long. Calyculus circa 3 mm. long. Perianthii tubus (inapertus) vix 3·5 cm. long., cum basi inflato (2 mm. long. et lat.) et limbo 5 mm. long. Antheræ 1·5 mm. long.

A member of the subsection *Constrictiflori*, near the Usambara species *L. elegantulus*, Engl., but has much larger, differently-shaped leaves and several-flowered capitula; the flowers are red, not ferruginous, and are subtended by glabrous bracts. It also approaches *L. senegalensis*, De Wild., from Senegal, which is, however, described as having broader oval leaves with cuneiform base.

LORANTHUS (§ Isnanthus) BAGSHAWEI, sp. nov.

Frutex glaber ramis fusco-brunneis, lenticellatis; foliis oppositis, siccis chartaceis, anguste lanceolatis, ad apicem subacutum angustatis, basi cuneatis, penninervatis, nervo mediano infra conspicuo, lateralibus vix conspicuis; petiolo brevi, superne canaliculato; capitulis axillaribus, multifloris, brevissime pedunculatis, pedicello brevi; bractea breviter cupuliforme et unilateraliter breviter producta, margine velut in calyculo ciliolata; calyculo supra ovarium breviter elongato, margine demum eroso; perigonio glabro, rubro, ante anthesin anguste cylindrico, sub apice paullo inflato obtuso, constricto, demum ad basin unilateraliter fisso; laciniis 4, linearibus, tubo longioribus, haud reflexis; filamentis linearibus, in dentem acutum, anthera triplo breviorem, exeuntibus; stylo tetragono, stigmate globoso.

Ruchigga. Fl. November, 401.

"Parasite on Malvacean shrub. Flowers red."

Internodia in ramis foliosis et florentibus 2–3 cm. long. Folia 5–10 cm. long., 1·5–2 cm. lat.; petioli vix 5 mm. long. Pedicellus vix 2 mm. long.; bractea circa 1 mm. long. Perianthium 12–13 mm. long., cum tubo 4–5 mm. long. vix 2 mm. diam. Antheræ vix 1·5 mm. long.

Near the Somaliland species *L. Ehlersii*, Schweinf., which it resembles in its many-flowered axillary heads of short, slender flowers; but is distinguished by its narrower leaves, smaller flowers, and the less prominent appendage of the filament below the anther.

LORANTHUS (§ Tapinanthus) BUVUMÆ, sp. nov.

Frutex glaber ramis adultioribus griseis, striatulis, inconspicue lenticellatis; foliis oppositis, coriaceis, oblongis vel oblongo-ovatis, acutis, basi subcuneatis, nervis lateralibus utrinque 3, ascendentibus; petiolo pro genere longo, in facie superiore vix canaliculato; capitulis axillaribus, plurifloris, sessilibus, pedicello brevi: bractea brevi oblique cupuliforme, velut in calyculo sparse brunneo-pubescente et ciliolata; calyculo supra ovarium breviter infundibuliforme, demum fisso; perigonio puberulo, rubro albo-maculato, supra basin subglobosam valde constricto, deinde anguste-infundibuliforme et unilateraliter fisso, laciniis lineari-oblanceolatis, viridescentibus, apice appendice brevi triangulari instructis, curvulo-reflexis; filamentis linearibus, in dentem subacutum quam anthera triplo breviorem exeuntibus; stylo crasso pentagono infra stigma obovoideum valde attenuato.

Island of Buvúma, Victoria Nyanza. Fl. March, 628.

"Parasite on incense-tree; red flowers speckled with white."

Internodia in ramis foliiferis 2–5·5 cm. long., in ramis florentibus 4–5·5 cm. Folia 6–10 cm. long., 2–4 cm. lat.; petioli sæpius 1·5–2 cm. long. Pedicellus 2 mm. long.; bractea circa 1 mm. long. Calyculus 1·5–2 mm. supra ovarium productus. Perianthii basis inflata vix 5 mm. long. et circa 4 mm. lat.; tubus circa 4·5 cm. long., cum lobis reflexis (vix 1 cm. long. et circa 1 mm. lat.). Antheræ vix 2 mm. long.

A member of Engler's subsection *Constrictiflori* near the Cameroon species *L. ogowensis*, which it resembles in the appendaged perianth-segments, but differs in its rather larger flowers with broader perianth-tube and narrow-based leaves.

VISCUM DICHOTOMUM, *D. Don, Prodr. Fl. Nepal.* 142.

Common in Ruchigga. In young fruit, November, 433.

Distrib. India; Madagascar; South Africa.

VISCUM TUBERCULATUM, *A. Rich. Tent. Fl. Abyss.* i. 338.

Near Kikobe Ferry, Kagera River. Parasitic on several species of herbs. Fr. March, 178. Native name "Ngurukizi."

Near Mulema. Fr. June, 332 & 342.

Distrib. Abyssinia, Usambara, Angola.

V. NYANZENSE, sp. nov.

Frutex ramis atrobrunneis, adultioribus teretibus, juvenilibus subcompressis, longitudinaliter sulcatis; foliis internodia excedentibus, ovalibus, apice et basi angustatis, vel interdum apice obtusis, vix petiolatis, subcoriaceis, trinervibus, nervis utrinque vix conspicuis; inflorescentiis 3-floris, brevissimis, sessilibus, bracteis brevibus, crassis, late triangulari-ovatis, apice rotundis; floribus sessilibus; perigonii sepalis crassis, triangulari-ovatis, obtusis; ovariis et baccis ellipsoideis, albis, levibus.

Island of Buvúma, Victoria Nyanza. Fl. & Fr. March, 654.

"Parasitic on 'nsali.'"

Internodia in ramis foliiferis 2·5–3 cm. long. Folia 3–5 cm. long., 1·5–vix 2·5 cm. lat. Cymi 3 mm. long., bracteæ 1 mm. long. Perianthii segmenta ·75 mm. long. Ovarium 1·5 mm. long.

A member of the section *Pleionuxia* near *V. Fischeri*, Engl., from German East Africa, but distinguished by the differently-shaped leaves and sessile inflorescence.

V. BAGSHAWEI, sp. nov.

Frutex aphyllus densiter multiramosus, ramis penultimis sæpe ternatim verticillatis, ultimis sæpius pinnatim patentibus; internodiis crassis, teretibus, vel junioribus subcompressis, atrobrunneis; cataphyllis late ovatis, apice rotundis, margine scariosis et pallidis; baccis sessilibus, in axillis solitariis, globosis, luteis, levibus, apice paullo truncatis et styli basi coronatis; bracteis cataphyllis conformibus.

Hab. Near Mulema. Fr. June, 333.

"Parasitic on Acacia. Fruit yellow and smooth."

Rami adultiores ad 6 mm. diam., cum internodiis 3–2 cm. long. Internodia in ramis juvenioribus æquilonga sed 2 mm. diam., in ramis ultimis vix 1 cm. long. et circa

1·5 mm. diam. Cataphylla 1·5 mm. long. Bacca vix 7 mm. diam.

The branches are very brittle, separating into internodal segments at a touch when dry.

A member of the section *Aspiduxia* near *V. Schimperi*, Engl., an Abyssinian species, from which it differs in the darker, more densely and less regularly branched shoots and the globose berry. Also evidently closely allied to the more southern species *V. Goetzei*, Engl., from the Kinga Mountains (in the extreme south of German East Africa), which grows at about 7000 feet elevation parasitic on a species of *Loranthus*. I have not seen a specimen of this; the berry is smaller and described as ovoid.

SANTALACEÆ.

OSYRIS ABYSSINICUS, *Hochst. in Flora*, xxiv. (1841), *Intelligenzbl.* i. 22.

Ruchigga. Fl. November, 447.

Distrib. East and West Tropical Africa.

BALANOPHOREÆ.

THONNINGIA SANGUINEA, *Vahl, in Dansk. Selsk. Skrivt.* vi. (1810) 125, t. 6.

Lake-shore, Musozi, in thick shade. Fl. February, 157.

Distrib. Upper Guinea; Ruwenzori.

EUPHORBIACEÆ.

EUPHORBIA (§ Euphorbium) MULEMÆ, sp. nov.

Frutex vel arbor glabra, ramis foliiferis crassis; foliis alternis, siccis caducis, sessilibus, lineari-lanceolatis, apice breviter aristulatis, nervo mediano lato, utrinque prominente; inflorescentia dichotome ramosa, ramis articulatis, bracteis late ovatis vel orbiculari-ovatis, apice aristatis, cyathiis minute pubescentibus, lobis rotundatis, fimbriatis, glandulis 4, carnosis, glabris, flabellatis, margine superiore crenatis, dorso longius pectinatis, processibus apice in ramis glanduligeris desinentibus; bracteis floralibus basi angustis, sub medium in ramis filiformibus pilosis desinentibus; ovario glabro, stylo cum ramis veluti antheris sparse et minute pubescente.

Hab. Mulema. Fl. May, 321; June, 340.

"Tree or shrub with latex."

Ramus foliifer 2·5 dm. long., basi pæne 1 cm. diam.; internodia ad 1 cm. long. Folia 18–20 cm. long., ad 2 cm. lat. Bracteæ 2–3 cm. long., seta exclusa (circa 1·5 cm. long.). Cyathia cum glandulis 3 cm. diam.; glandulæ 1 cm. lat., processus pæne 1 cm. long.

Near the South and South-west African *E. Monteiri*, Hook. fil. (= *E. Marlothii*, Pax), which it resembles in general habit and the structure of the cyathium, but is distinguished by the narrow tapering pointed leaves, aristate bracts, and longer gland-processes.

PHYLLANTHUS NIRURI, *Linn. Sp. Pl.* 981.

Near Mulema. Fl. & Fr. June, 351.

Distrib. Widely spread in the tropics.

P. UGANDENSIS, sp. nov.

Frutex effusus floribundus monoicus glaber, ramis, ramulisque rubescentibus; foliis distichis, deciduis, suboblongis, basi autem paullo angustatis, integris, obtusis; stipulis scariosis, triangularibus, rubro-brunneis, ciliolatis; ramulis florentibus brevibus, solitariis, vel sæpe 2–3-fasciculatis, multifloris; floribus tenuiter pedicellatis, in axillis fasciculatis; flore masculo 4-mero, perianthii segmentis binis exterioribus ellipticis, interioribus oblatis, cum glandulis crassiusculis ellipsoideis alternantibus; staminibus inæqualiter connatis, antheris longitudinaliter dehiscentibus; floris fœminei, segmentis perianthii 5, subobovatis, uno autem minore et elliptico; ovario cum annulo brevi cincto, 4-loculare; stylis 4 liberis, stigmate reflexo; pericarpio ? carnoso.

Hab. Uganda, coast of Victoria Nyanza. Fl. & Fr. (?), February, 571.

Ramuli ultimi foliiferi et florentes circa 1·5 cm. long. Folia vix 1 cm. long. Perianthii segmenta in flore masculo vix 2 mm. long., in flore fœmineo 2 mm. long.

A very distinct species, suggesting in general habit *P. floribundus*, Müll. Arg., or *P. reticulatus*, Poir., but distinguished by the tetramery of the andrœcium and gynæcium. The material includes a branch of somewhat different appearance from the rest, bearing fleshy fruit, which is perhaps conspecific.

BRIDELIA MICRANTHA, *Baill. Adansonia*, iii. (1862) 164.

In plantation, Musozi. Fl. January, 100.

Native name "Katagamiti."

Distrib. East and West Tropical Africa; Natal.

ANTIDESMA MEMBRANACEUM, var. MOLLE, *Muell. Arg. in DC. Prodr.* xv. II. 261.

Musozi. Female flower, December, 47.

"Low tree with spreading depending branches."

Distrib. Angola.

CYCLOSTEMON UGANDENSIS, sp. nov.

Arbor humilis dioica, glaberrima; cortice cinereo; foliis breviter petiolatis, coriaceis, oblongo-ellipticis, apice acuminatis, basi inæqualibus, obsolete denticulatis, supra nitidis, infra cum nervis secundariis 6–7, arcuato-ascendentibus, superne anastomosantibus, cum venis reticulatis prominulis; stipulis caducis; floribus masculis in trunco fasciculatis, longius pedicellatis, alabastris globosis; sepalis 5 glabris, suborbicularibus, obtusis, integris; staminibus numerosis, antheris innatis, subovato-cordatis; floribus fœmineis masculis similibus, ovario globoso, stigmatibus dilatatis, retusis; fructu immaturo (post sepala delapsa) pisiforme, nigrescente; pericarpio duro.

Hab. Island of Buvúma, Victoria Nyanza. Fl. March, 613.

"Low tree with cream-coloured flowers borne on old wood."

Folia 13–15 cm. long., 4–5 cm. lat.; petioli circa 3 mm. long. Pedicellus floris masculi 10–13 mm. long.; flos circa 1 cm. diam.; sepala exteriora circa 8 mm. long. et lat.; filamenta 0·5 cm. long.; antheræ 4 mm. long. Fructus immaturus circa 5 mm. diam.

An interesting addition to this tropical Old World genus, which finds its chief development in Africa in the Upper Guinea District (Cameroons, Niger province, and Sierra Leone), with two species in Natal, but has only recently been discovered in East Tropical Africa, Dr. Pax having described two species from Western Usambara. It is to one of these last, *C. major*, that our species is most nearly allied; it differs in having smaller acuminate leaves, pedicelled flowers, and entire sepals.

CROTON MACROSTACHYS, *A. Rich. Tent. Fl. Abyss.* ii. 251.

Buvúma Island, Victoria Nyanza. Fl. March, 648.

Distrib. Abyssinia to Nyassaland.

CLUYTIA ABYSSINICA, *Jaub. & Spach, Ill. Pl. Or.* v. t. 468.
Ruchigga. Fl. November, 423.
Distrib. East Tropical Africa.

ERYTHROCOCCA PAXII, sp. nov. (Pl. **3**.)

Frutex dioicus multiramosus, ramis lignosis duris, cum cortice cinereo-brunneo striatulo et lenticellis conspicuis instructis; ramis novellis apice pilosis, infra glabrescentibus; foliis glabris rarius in petiolo brevi et venis sparse pilosis, parvis, crassiusculis, lanceolatis, basi et apice plus minusve acutis, margine serrulatis; stipulis in spinulas pallidas deciduas mutatis; floribus masculis sub apice pedunculorum tenuium axillarium, 20-50-spicato-fasciculatis; pedicellis gracilibus; calyce 4-partito, segmentis ovatis, obtusis, staminibus numerosis (15), filamentibus et glandulis intrastaminalibus pallide roseis, his breviter pedicellatis, apice crasso obtusis; floribus fœmineis quam in mare paucioribus, calyce trifido, lobis orbicularibus, glandulis 3, pallidis, triangulari-ovatis, lobis subæqualibus; ovario tricocco, glabro, stigmatibus tribus, margine pectinatis; fructu 2–3-locellato, loculis monospermis; semine globoso purpureo-tincto, reticulato.

Hab. Near River Rufúa. Fl. & Fr. December, 513.

"Diœcious shrub with green flowers."

Folia 3–5 cm. long., ad 1·5 cm. lat.; petiolus ad 6 mm. long.; stipulæ vix 2 mm. long. Inflorescentiæ masculæ ·5–1 cm. long. Flores circa 4 mm. diam. Flores fœmineæ breviter pedicellatæ, vix 2 mm. diam. Semina 4 mm. diam.

Distinguished from the other species of the genus by the 4-partite perianth of the male flowers. Perhaps most nearly allied to *E. bongensis*, Pax (which I have not seen, and of which only male specimens are described), which it resembles in the close aggregation of the male flowers, the numerous stamens and the form of the staminodes, but is distinguished by the 4-partite male perianth, narrower leaves, and pedunculate inflorescence.

This species was also collected on Mt. Kilimanjaro, at Marangu, at 5000 ft., by Volkens (No. 2354).

HASSKARLIA DIDYMOSTEMON, *Baill. Adansonia*, i. (1860) 52.
Island of Buvúma, Victoria Nyanza. Male fl. March, 661.
Distrib. Sierra Leone; Angola.

CLAOXYLON AFRICANUM, *Muell. Arg. in DC. Prodr.* xv. II. 77.
Coast of Victoria Nyanza. Male fl. March, 588.
Distrib. Upper Guinea.

ACALYPHA ORNATA, *A. Rich. Tent. Fl. Abyss.* ii. 247.
Kagera Valley, near Mulema. Fl. May, 288 in part.
Distrib. East and West Tropical Africa.

ALCHORNEA CORDIFOLIA, *Muell. Arg. in Linnæa,* xxxiv. (1865) 170.

Swamp, Musozi. Fruit, Dec. (young fruit) & Feb., 66.

"A shrubby tree very common at edge of swamps; the terminal branches are vertical, the petioles ascend and the leaves droop all round. Small ants live in some of the swollen nodes."

Distrib. East and West Tropical Africa.

MACARANGA MONANDRA, *Muell. Arg. in Journ. Bot.* ii. (1864) 337.

Musozi. Female fl. & young fr. December, 4.
Distrib. Cameroons; Angola.

TRAGIA VOLKENSII, *Pax, in Engler, Pflanzenwelt Ost-Afr.* C. 240.

Ruchigga. Fl. & Fr. November, 455.
Distrib. Mt. Kilimanjaro.

SAPIUM MANNIANUM, *Hiern, in Welw. Cat.* i. 986.
Musozi. Fl. & Fr. February, 145.
Native name "Musasa." "Tree with white latex, used for posts in hut building."
Distrib. West Tropical Africa.

URTICACEÆ.

FICUS EXASPERATA, *Vahl, Enum.* ii. 197.
Musozi. January, 121.
Native name "Luwau." "Leaf used as sand-paper to polish gourds and sticks."
Distrib. West Tropical Africa.

F. CYATHISTIPULA, *Warb. in Engler, Pflanzenwelt Ost-Afr.* C. 161.

Musozi, shrub in marsh, Lake shore. Fr. January, 139.
Distrib. East Tropical Africa; Zanzibar Island and Central Lake Region.

TRECULIA AFRICANA, *Decne. ex Tréc. in Ann. Sci. Nat.* sér. III. viii. (1847) 109.

Island of Buvúma, Victoria Nyanza. Fl. March, 634.

Distrib. Tropical Africa.

IPO TOXICARIA, *Pers. Syn.* ii. 566. (Antiaris toxicaria, *Leschen. in Ann. Mus. Par.* xvi. (1810) 478.)

Musozi. Fl. & Fr. January, 107.

Native name "Kirundo." "A large tree, trunk 15–20 ft. in circumference 5 ft. from the ground. Very straight stem; branches high. Blown down inflorescence only obtained. Cloth made from the bark, and beer-vats from the wood."

Distrib. Tropical Asia and West Tropical Africa (Angola).

The specimens agree with those found by Welwitsch in Golungo Alto, and referred by Hiern to this species, but subsequently separated by Engler as a new species, differing from the common Asiatic in being diœcious (*fide* Welwitsch), and having the leaves blunt, not cordate at the base. Dr. Bagshawe makes no reference to the plant being diœcious; his number 107 comprises detached fruits and short branches bearing male flowers. The leaf-base varies considerably in the African specimens, from cuneate to rounded or shallowly retuse, in the last form resembling some Asiatic specimens.

URERA CAMEROONENSIS, *Wedd. in DC. Prodr.* xvi. I. 97.

Musozi. Fl. & Fr. January, February.

Distrib. German East Africa; Cameroons.

MYRIANTHUS ARBOREUS, *Beauv. Fl. Owar.* i. 16.

Mouth of Kagera. Fr. February, 159.

Distrib. Widely spread in Tropical Africa.

The specimen comprises fruits and a very young leaf, but is, I think, referable to this species.

TREMA AFFINIS, *Blume, Mus. Bot. Lugd.-Bat.* ii. 58.

Island of Buvúma, Victoria Nyanza. Fl. & Fr. March, 631.

Distrib. East and West Tropical Africa.

MONOCOTYLEDONS.

(By A. B. Rendle, D.Sc., F.L.S.)

HYDROCHARIDEÆ.

Ottelia Baumii, *Gürke, in Baum, Kunen.-Sambesi Exped.* 171.

River Rufúa, submerged, except the flower, in 2–3 feet of water. Fl. December, 533.

Distrib. Manonge on the River Kuebe, German South-West Africa.

ORCHIDEÆ.

Liparis ruwenzoriensis, *Rolfe, in Dyer, Fl. Trop. Afr.* vii. 20.

Mouth of Kagera River. Fl. February, 160.

Distrib. Butagu, at 9000 ft. on Mt. Ruwenzori.

Eulophia dichroma, *Rolfe, l. c.* 62.

Ruchigga. Fl. November, 411 in part.

Distrib. Huilla, Angola.

E. subulata, *Rendle, in Journ. Bot.* xxxiii. (1895) 193.

Ruchigga. Fl. November, 411 in part. "Flowers yellow."

Distrib. Uganda; Nyassaland.

E. missionis, *Rendle, l. c.* 168.

Ruchigga, 7300 feet. Fl. December, 525.

There are slight differences in the floral details between the Uganda plant and that collected in Nyassaland by Scott Elliot from which the species was described. The petals are slightly shorter and blunter (9 mm. long by 5 mm. broad), the lateral lobes of the lip are distinctly shorter (2·5 mm. long), and the fimbriform processes on the median lobe are fewer and shorter in the Uganda specimens.

Distrib. Nyassaland, foot of Mt. Milanji about 4000 ft.

Lissochilus Wilsoni, *Rolfe, in Dyer, Fl. Trop. Afr.* vii. 79.

Lake shore, Musozi. Fl. January, 108.

Distrib. Usongora, British East Africa.

L. mediocris, *Rendle, in Journ. Bot.* xxxiii. (1895) 193.

Near Mulema. Fl. June, 367.

"An erect herb, 30 inches high; flowers blue and bluish white."

Distrib. Kavirondo, British East Africa.

LISSOCHILUS ARENARIUS, *Lindl. in Journ. Linn. Soc., Bot.* vi. (1862) 133.

Near Lake Karenge. Fl. November. No number.

Distrib. Widely diffused in Tropical Africa; also in Natal.

L. NYASÆ, *Rolfe, in Dyer, Fl. Trop. Afr.* vii. 86.

Ruchigga, 6000 ft. Fl. November, 462.

"5–6 feet high."

Distrib. Nyassaland.

L. KREBSII, *Reichb. f. in Linnæa*, xx. (1847) 685.

Ruchigga, 6800 ft. Fl. November, 427.

A fine plant with leaves 1½ ft. long and scapes 3 ft. high; differing from the other specimens which I have seen in its broadly elliptical, almost suborbicular sepals. Mr. Rolfe, who has kindly given me his opinion on our specimen, agrees that it is probably merely a form of this somewhat variable species.

Distrib. Lake District on Mount Milanji, and on the Morambala Mountains in Portuguese East Africa. Also in South Africa.

PTEROGLOSSASPIS RUWENZORIENSIS, *Rolfe, in Dyer, Fl. Trop. Afr.* vii. 100.

Near Lake Karenge. Fl. November. No number.

Distrib. Mt. Ruwenzori, 5300–7000 ft.

P. CARSONI, *Rolfe, l. c.*; var. MAJOR, var. nov. Planta egregia, foliis bipedalibus et scapo (cum racemo) 2½-pedale; racemo 5 cm. long., quam in specie laxiore; bracteis 4·5 cm. long.; floribus paullo majoribus cum sepalis petalisque paullo latioribus.

Hab. Kagera Valley near Mulema. Fl. May, 276.

"Flowers white with red centre."

Distrib. The species occurs in British Central Africa.

POLYSTACHYA CULTRATA, *Lindl. Bot. Reg.* sub t. 851.

Ruchigga. Fl. November, 412; fr., 425 in part.

'Tree orchid with pink flowers."

Distrib. Cameroons, Kilimanjaro, and mountains of Usambara. Also Madagascar, Mauritius, and Bourbon.

P. NIGRESCENS, *Rendle, in Journ. Bot.* xxxiii. (1895) 200.

Hunga. Fl. November, 388.

"Tree orchid with yellow flowers."

Distrib. Ruwenzori, 7000–10,000 ft.

Differs from the original specimens collected by Scott Elliot on Ruwenzori, in its branched inflorescence, the branches being each a little shorter than the floriferous portion of the main shoot. This character is of interest, as the species has hitherto been contrasted with those most nearly allied to it by its simple inflorescence.

POLYSTACHYA MUSOZENSIS, sp. nov.

Planta habitu *P. imbricatæ*, Rolfe, caulibus pedalibus plurifoliatis, foliis lineari-oblongis 5-nervibus, siccis atrobrunneis; paniculæ ramis pluribus internodia excedentibus; bracteis imbricatis, demum patentibus, e basi lata acutis, pedicello cum ovario brevioribus; floribus parvis, siccis nigrescentibus; sepalo dorsali ovato-oblongo, breviter acuto; sepalis lateralibus triangulari-acutis, cum columnæ pede mentum conspicuum rotundatum formantibus; petalis lineari-spathulatis, obtusis, 3-nervibus; labello complicato, late unguiculato, superne trilobo, lobo medio obtuso obsolete apiculato; lobis lateralibus erectis rotundatis, disco cum callo breviter linguiforme basi instructo; columna brevi.

Hab. Lake shore, Musozi. Fl. January, 80.

"Flowers greenish yellow."

Folia circa 15 cm. long., 8–16 mm. lat. Panicula circa 7 cm. long., rami 1·5–2·5 cm. long. Bracteæ circa 2 mm. long. Flores circa 1 cm. long. Sepalum dorsale 6–7 mm. long., circa 2·5 mm. lat.; sepala lateralia circa 8 mm. long., eorum basis cum mento 7 mm. long. Petala circa 6 mm. long., 1·3 mm. lat. Labellum vix 9 mm. long., 6 mm. lat.; ejus unguis parti superiori subæquans 2–2·5 mm. lat. Columna 1 mm. long.

Near *P. imbricata*, Rolfe, but differs in its laxer panicle and the larger, differently shaped lip of the flower. Also close to *P. Kraenzlinii*, Rolfe, from Usambara, but distinguished by lip characters.

P. NYANZENSIS, sp. nov.

Planta pseudobulbis cæspitosis angustis, teretibus, unifoliatis, pæne ad apicem vaginatis; folio sessile, lineari-oblongo, basi et apice obtuso angustato, plurinerve, sicco membranaceo, brunneo-nigrescente; scapo simplici, sub parte florifera compresso, veluti bracteis floribusque brunneo-puberulo; bracteis e basi triangulari acuminatis, demum aristuliferis, pedicellos excedentibus; floribus parvis; sepalo dorsali elliptico, apice breviter caudato; sepalis lateralibus late triangularibus, obsolete caudatis cum columnæ pede mentum obtusum ipsis brevior formantibus; petalis lineari-spathulatis, obtusis, obsolete apiculatis; labello conduplicato, late unguiculato, trilobo, lobo medio orbiculare, obtuso, lobis lateralibus erectis, oblique ovatis, disco cum callo tuberculiforme basi instructo; columna robusta, 1 mm. longa; capsulis sparse puberulis, anguste oblongis.

Hab. Lake shore, Musozi. Fl. & Fr. January, 96.

Pseudobulbi 6·5 cm. long., circa 4 mm. diam. Folia circa 13–15 cm. long., 1–2 cm. lat. Scapus circa 10 cm. long., pars florifera circa 5 cm. long. Bracteæ 5–7 mm. long., pedicellus 2 mm. long. Sepalum dorsale 5·5–6 mm. long., cauda breve (vix 2 mm. long.) inclusa, 3 mm. lat., sepala lateralia 7 mm. long. et lat., mento incluso (3 mm. long.). Petala 4–5 mm. long. Labellum 8 mm. long., 4–4·5 mm. lat. Lobus medianus c. 3 mm. long. et lat., lobi laterales c. 1 mm. long. Columna 1 mm. long. Capsula circa 2 cm. long.

Near *P. Kirkii*, Rolfe, from the Mombasa district, which it resembles in habit, but is distinguished by the minute details of the flower, such as the shortly caudate dorsal sepal, shape of the petals, orbicular mid-lobe of lip, &c.

POLYSTACHYA INCONSPICUA, sp. nov.

Planta parvula, habitu *P. alpinæ*, Lindl., sicca nigrescens, caulibus brevibus cæspitosis in radicibus numerosis densius nidulantibus; pseudobulbis angustis subteretibus, quoque cum vagina tubuliforme circumdato, unifoliatis; folio sessile lineari-lanceolato, acuto; scapo racemoso folio subæquali, glabro, in parte inferiore compresso, sub medio bracteato, supra medium florifero cum bracteis parvis late ovato-triangularibus, acutis, pedicellum brevem excedentibus; floribus parvulis luteis; sepalo dorsali concavo, late elliptico, obtuso; sepalis lateralibus dorsali similibus sed in mentum elongatum apice bigibbosum cum columnæ pede extensis; petalis spathulatis, obtusis; labello valde unguiculato, basi paullo ampliato, supra medium trilobato, lobo medio orbiculare, lobis lateralibus paullo minoribus, ovato-oblongis, obtusis; disco cum crista transversa instructo; columna breve, robusta; capsulis ellipsoideis.

Hab. Ruchigga. Fl. November, 425 in part.

"Flowers yellowish."

Caulis, racemo incluso, 4 cm. long. Pseudobulbi circa 1 cm. long. vel minores, 1–1·5 mm. diam. Folia ad 2–2·5 cm. long., circa 5 cm. lat. Scapus 2–2·5 cm. long.; bracteæ fertiles 1·5 mm. long. Flores circa 6 mm. long. Sepalum dorsale 2·5 mm. long., vix 2 mm. lat. Sepala lateralia æquilonga; mentum 3 mm. long. Petala circa 2 mm. long. Labellum circa 6 mm. long. ad 3 mm. lat.; unguis pæne 4 mm. long.; basi 1·5 mm. lat., lobus medianus 1·5 mm. long. Columna circa 1 mm. long. Capsula 8 mm. long., circa 4 mm. diam.

A distinct species recalling *P. alpina*, Lindl. (from Fernando Po), in its habit and minute flowers, but distinguished by the several-flowered raceme and the details of floral structure, especially the absence of the large callus on the lip.

POLYSTACHYA ARISTULIFERA, sp. nov.

Planta habitu *P. fusiformis*, Lindl., pseudobulbis superpositis, cylindricis, superne latioribus, folio infimo elliptico, superioribus majoribus, lineari-oblongis ad lanceolatis; paniculis puberulis; bracteis e basi lata setiformibus, in parte paniculæ inferiore pedicellum brevissimum cum ovario æquantibus, in parte superiore brevioribus; floribus parvis glabrescentibus; sepalo dorsali late ovato, apice acuminato breviter caudato, 3-nervi, sepalis lateralibus dorsali similibus sed latioribus (triangulari-ovatis) cum columna mentum saccatum obtusum formantibus; petalis lineari-oblongis, acutis, uninervibus; labello late unguiculato, trinervi, trilobato, lobo medio orbiculare ex apice retuso apiculato, margine crispulato, lobis lateralibus orbiculari-ovatis, obtusis, suberectis, disco cum callo parvo rotundato instructo; columna robusta; capsulis oblongis.

Hab. Ruchigga. Fl. November, 446.

Pseudobulbi circa 4 cm. long. Folium infimum 3·5–5 cm. long., 1·5–2 cm. lat., superiora ad 12 cm. long., 1·8 cm. lat. Panicula circa 6 cm. long. Bracteæ ad 1 cm. long. in parte paniculæ inferiore, in parte superiore duplo minores.

Flores ·5 cm. long. Sepalum dorsale 4·5 mm. long.; sepala lateralia 5 mm. long. Petala circa 4 mm. long., vix 1 mm. lat. Labellum 4·5 mm. long., vix 4 mm. lat. Lobus medius, lobos laterales excedens, paullo plus quam 2 mm. long. et lat. Columna vix plus quam 1 mm. long.

Very near *Polystachya fusiformis*, but distinguished by the less diffuse panicle, and the larger flowers with tailed sepals.

LISTROSTACHYS VESICATA, *Reichb. f. in Flora*, xlviii. (1865) 190.

Wood near Kabora river. Fl. February, 169.

"Flowers yellow."

Distrib. Coast region of Bay of Guinea from Ashanti to Cameroons.

MYSTACIDIUM UGANDENSE, sp. nov.

Planta habitu *M. xanthopollinii*, caule elongato cum radicibus, foliorum vaginas persistentes perforantibus, instructo; foliis linearibus, apice inæqualiter bilobis; racemis axillaribus, folia subæquantibus, sublaxiter plurifloris (flores circa 10); bracteis ocreatis, obscure apiculatis; floribus brevissime pedicellatis; sepalo dorsali elliptico-oblongo, breviter apiculato, cum nervo mediano valido, lateralibus oblongis vix apiculatis; petalis late ellipticis, obtusis, manifeste 5-nervibus; labello flabelliforme, valde emarginato, margine edentula, venis numerosis radiantibus conspicue lineato, calcari anguste cylindrico recurvato, quam labello paullo longiore; rostello rostrato, polliniorum stipitibus glandulisque geminis ut in genere.

Hab. Ruchigga. Fl. November, 425 in part.

Caulis 8–9 cm. long., circa 4 mm. diam. Foliorum vaginæ persistentes circa 8 mm. long. Folia circa 6 cm. long., 5–6 mm. lat. Bracteæ 2 mm. long., pedicellus cum ovario vix 3 mm. long. Sepalum dorsale 4 mm. long., vix 2 mm. lat.; sepala lateralia æquilonga sed paullo angustiora. Petala sepalis æquilonga 2·5 mm. lat. Labellum vix 6 mm. long. et paullo latior; calcar labello subæquans, 1 mm. diam. Columna vix 2 mm. long.

I have carefully compared the flowers of this plant with flowers of the type of *M. xanthopollinium*, collected by Welwitsch in Angola, and think that the Uganda plant certainly represents a distinct species. The parts of the flower in the Uganda plant are prominently veined and lack the copious pustulation of the

Angolan specimens, and the lip is markedly different in the two sets of specimens, being larger in the Uganda form with a well-marked central notch, while in the Angolan plant there is a small central lobe. The leaves are also narrower, and the racemes shorter and less densely flowered than in *M. xanthopollinium.*

BRACHYCORYTHIS PUBESCENS, *Harv. Thes. Cap.* i. 35, t. 54.
Near Lake Karenge. Fl. November. No number.
Distrib. British East Africa and Nyassaland, also Angola. Also in the Transvaal and Natal.

HABENARIA FOLIOSA, *Reichb. f. in Flora*, l. (1867) 100.
Bank of River Kagera, near Mulema. Fl. June, 323.
"Flowers white."

The specimen approaches my var. *epipactidea* (Welw. Cat. ii. 15) (*H. epipactidea*, Reichb. f.), a plant collected by Welwitsch in marshes near the River Monino, in Huilla.

H. NDIANA, *Rendle, in Journ. Linn. Soc., Bot.* xxx. (1895) 393.
Near Mulema. Fl. May, 265.
"Flowers greenish."
Distrib. British East Africa: Ndi Mountains, at 4400 ft.

H. HOCHSTETTERIANÆ, *Kränzl. ex Engler, Hochgebirgsfl. Trop. Afr.* 180.
Near Lake Karenge. Fl. November. No number.
Distrib. Abyssinia.

H. SOYAUXII, *Kränzl. in Engler, Jahrb.* xvi. (1892) 93.
Near River Rufúa. Fl. December, 501; and in marsh, Kanabulim; Fl. November, 35.
"White flowers."

An interesting discovery, as the species has only hitherto been known from the original locality, Kitamba in the Gaboon, West Tropical Africa.

Dr. Kränzlin has kindly compared our specimen with his type in the Berlin Herbarium, and confirms my opinion as to the identity of the plants. The spur in the Uganda specimens is filiform only for about two-thirds of its length, the apical portion being inflated. Dr. Kränzlin finds that in his specimen the apical portion has shrivelled, the spur being apparently filiform throughout its length and suggests that this represents a later stage.

The species is a fine one and among the largest flowered in the genus.

BONATEA KAYSERI, *Rolfe, in Dyer, Fl. Trop. Afr.* vii. 255.
Hillside near Mulema. Fl. May, 273.
Native name "Duvera." "Green and white flowers."
Distrib. Mt. Kilimanjaro, 4500–5000 ft.; and Mlalo, Usambara.

SATYRIUM CORIOPHOROIDES, *A. Rich. in Ann. Sc. Nat.* sér. II. xiv. (1840) 274.
Near Lake Karenge. Fl. November. No number.
Distrib. Abyssinia.

S. NILOTICUM, *Rendle, in Journ. Bot.* xxxiii. (1895) 296.
Ruchigga, in marsh, 6000 ft. Fl. November, 461.
Distrib. Uganda, 7000–8000 ft. on the Nandi Range, Kavirondo.

DISA ERUBESCENS, *Rendle, in Journ. Bot.* xxxiii. (1895) 297.
Ruchigga, 7700 ft. Fl. December, 468.
Distr. Mt. Ruwenzori, 6000–7000 ft., and mountains of British Central African Lake-district.

D. OCHROSTACHYA, *Reichb. f. in Flora,* lxviii. (1865) 181.
Var. MAJOR, var. nov. Planta robusta, caule 8 mm. crasso, ad inflorescentiæ basin 5 dm. alt.; spica quam in specie longiore et densiore, plus quam 3 dm. long., 2–2·5 cm. diam.
Near Lake Karenge. Fl. November. No number.
Distrib. The species occurs in Huilla, Angola.

Dr. Bagshawe's plant represents a more robust and more floriferous form of the Angolan species; there is no distinguishing feature in the flowers.

D. STOLONIFERA, *Rendle,* n. sp.
Herba erecta, rufescens, glabra, stolonifera, caule 3·5 dm., foliato, et cum vaginis membranaceis induto; foliis erecto-patentibus, e vagina amplexicaule, linearibus, acutis, supra caulis medium in bracteas decrescentibus; spica ellipsoidea, sublaxiter multiflora; bracteis lanceolatis, acuminatis, ovario subæquantibus; floribus roseis, erecto-patentibus; sepalo dorsali, erecto, cucullato, obtuso, dorso in calcar sub-basale, longum, tenue, arcuato-patens producto, sepalis lateralibus elliptico-oblongis, obtusis, infra apicem apiculatis, petala et labellum excedentibus, his erectis e basi angustata subrhomboideis; labello patulo-

elliptico, basi angustato, apice obtuse apiculato; anthera horizontale; rostello truncato, cum plica inter antheræ loculos intermedia.

Hab. Ruchigga, in marsh, at 6000 ft. 463.

"Flowers pink."

Folia, cum vaginis, ad 2·4 dm. long., 1 cm. lat. Spica 8 cm. long., circa 4 cm. diam.; bracteæ 2 cm. long. Sepalum dorsale (complanatum) 8 mm. long.; antheræ 2·2 mm. long.; calcar 2·7 cm. long., circa 1 mm. crass. Sepala lateralia 11 mm. long., latitudine dimidio minora. Petala 8 mm. long., ad 4 mm. lat. Labellum vix 1 cm. long. et 4 mm. lat.

Near *Disa Stairsii*, Kränzl., but a less robust plant with narrower leaves, a less dense inflorescence, a longer spur to the dorsal sepal, larger lip, and broader larger petals.

IRIDACEÆ.

ARISTEA JOHNSTONIANA, *Rendle, in Trans. Linn. Soc.* ser. II., *Bot.* iv. (1894) 48.

Below Ruchigga. Fl. & fr. December, 504. Hill near R. Rufúa. Fl. & Fr. January, 546.

Distrib. East Tropical Africa.

GLADIOLUS QUARTINIANUS, *A. Rich. Tent. Fl. Abyss.* ii. 306.

Near River Rufúa. Fl. December, 514.

Ruchigga. In fl. November, 414.

Distrib. Widely distributed in the mountains of Tropical Africa.

AMARYLLIDACEÆ.

HYPOXIS VILLOSA, *Linn. f. Suppl.* 198.

Near Kikobe ferry on the River Kagera. Fl. March, 177.

Distrib. Tropical and South Africa.

CRINUM THRUPPII, *Baker, in James, Unknown Horn of Africa*, 322.

Kikobe ferry, River Kagera. Fl. March, 173.

Distrib. Previously collected in Somaliland and the northern part of British East Africa.

HÆMANTHUS RADCLIFFEI, sp. nov. (Pl. 4.)

Herba glabra e rhizomate crasso, radicifero; foliis tribus vel pluribus, e basi late vaginante longe petiolatis; petiolo

alato; lamina oblongo-elliptica, apice obtusa, basi in petiolum gradatim angustata, in sicco papyracea; venis, cum venulis transversalibus regulariter junctis, utrinque 6 conspicuis; scapo centrali, basi crasso, cum foliis membranaceis brevibus vaginato; bracteis involucrantibus scariosis, valde reflexis; umbella globosa, circa 20-flora; pedicellis quam bracteis longioribus; perianthii tubo tenui cylindrico, quam segmentis breviore, segmentis lineari-lanceolatis, acutis, patentibus, denuo reflexis, roseis, 5-nervibus; filamentis segmenta excedentibus.

Forest near mouth of River Kagera. Fl. February, 558.

"Herb with pink flowers."

Rhizoma 3 cm. long., 1·5 cm. crass. Petiolus circa 20 cm. long., complanatus, ·5 cm. lat., in laminam circa 20 cm. long., et 5 cm. lat. transiens. Scapus petiolos subæquans; bracteæ 2·5 cm. long. Umbella circa 13 cm. diam. Pedicelli circa 3·5 cm. long. Perianthii tubus 1·5 cm. long; circa 1 mm. diam.; segmenta 3 cm. long., vix ·5 cm. lat. Staminum filamenta ad 4 cm. long., antheræ 1·5 mm. long.

There is practically no bulb-development, the fleshy base of the scape being enveloped by the scarcely fleshy sheaths of the foliage-leaves and a number of inner membranous sheaths.

Near the Congo species, *Hæmanthus Lindeni*, N. E. Br., which, however, has a much more floriferous umbel, and ovate-lanceolate or ovate-oblong leaves with a broadly rounded, subtruncate or subcordate base.

DIOSCOREACEÆ.

DIOSCOREA QUARTINIANA, *A. Rich. Tent. Fl. Abyss.* ii. 316, t. 96 *a*.

Gully near Mulema. Fr. May, 295.

Native name "Echangarabom."

Distrib. Widely spread in Tropical Africa.

LILIACEÆ.

SMILAX KRAUSSIANA, *Meissn. in Flora*, xxviii. (1845) 312.

Edge of swamp, Musozi. Male fl. February, 165.

Native name "Mukdokolo." "Stem used to make fish-baskets."

Coast of Victoria Nyanza. Female fl., March, 586.
Distrib. Widely spread in Tropical Africa; also in South Africa.

ASPARAGUS BUCHANANI, *Baker, in Kew Bull.* (1893) 211.
Near Kikobe ferry, River Kagera. Fl. March, 179.
Native name "Rashavashava."
Distrib. German East Africa, Nyassaland and the Zambesi.

A. FALCATUS, *Linn. Sp. Pl.* 313.
Near Mulema. Fl. March, 186.
Distrib. Tropical and South Africa. Also Tropical Asia.

DRACÆNA STEUDNERI, *Engler, Pflanzenwelt Ost-Afr.* C. 143.
Musozi. Fr. January, 104.
Native name "Kikajo enjovu" (elephant's cane).
Distrib. Abyssinia.

I have not seen an authoritative specimen of this plant, and as our specimen bears no flowers, the determination is somewhat tentative. The woody apex of the shoot is nearly 2 cm. in diameter, and bears a head of crowded, long, narrowly lanceolate leaves tapering to the sheathing base, from 40–50 dm. long and 4 cm. or slightly less in breadth, with the midrib prominent for about two-thirds the length from the base. The shortly pedicellate flowers are fascicled in several clusters at the ends of the subcompressed branchlets of the panicle. The berries are from 1 to $1\frac{1}{4}$ cm. in diameter.

ALOE JOHNSTONI, *Baker, in Trans. Linn. Soc.* ser. II., *Bot.* ii. (1887) 351, t. 63.
Hillside, Mulema. Fl. April, 241.
Distrib. British East Africa.

BULBINE ASPHODELOIDES, *Schult. f. Syst. Veg.* vii. 444.
Near Kiboke ferry, River Kagera. Fl. March, 174.
Distrib. East Tropical Africa from Abyssinia to the Cape and Portuguese West Africa.

SCILLA CHLORANTHA, *Baker, in Dyer, Fl. Trop. Afr.* vii. 555.
Near Mulema. Fl. April, 259.
Leaves of some plants plain, of others mottled with brown spots.
Distrib. Bahr-el-Ghazal.

COMMELINACEÆ.

ANEILEMA BENINIENSE, *Kunth, Enum. Pl.* iv. 73.

Musozi. Fl. & fr. January, 129.

"About 5 feet high, supported by a mass of other vegetation in marsh with 6–12 inches of water, at edge of marsh forest. Flowers inconspicuous, purple."

Burumba, trailing at edge of brook. Fl. July, 371.

"Flowers pinkish blue."

Distrib. Widely spread in Tropical Africa.

POTAMOGETONACEÆ.

APONOGETON VALLISNERIOIDES, *Baker, in Trans. Linn. Soc.* xxix. (1873) 158.

Pool on hillside above Mulema. Fl. & young Fr., April, 251.

Distrib. Central Africa and Niger Territory.

GYMNOSPERMS.

(By A. B. RENDLE, D.Sc., F.L.S.)

PODOCARPUS MILANJIANA, *Rendle, in Trans. Linn. Soc.* ser. II., *Bot.* iv. (1894) 61.

Lake shore, Musozi. 125.

Native name "Chuzizimo." "Cut into planks for canoes."

Distrib. East Tropical Africa.

EXPLANATION OF THE PLATES.

PLATE 1.

TRIMERIA MACROPHYLLA, Baker fil.

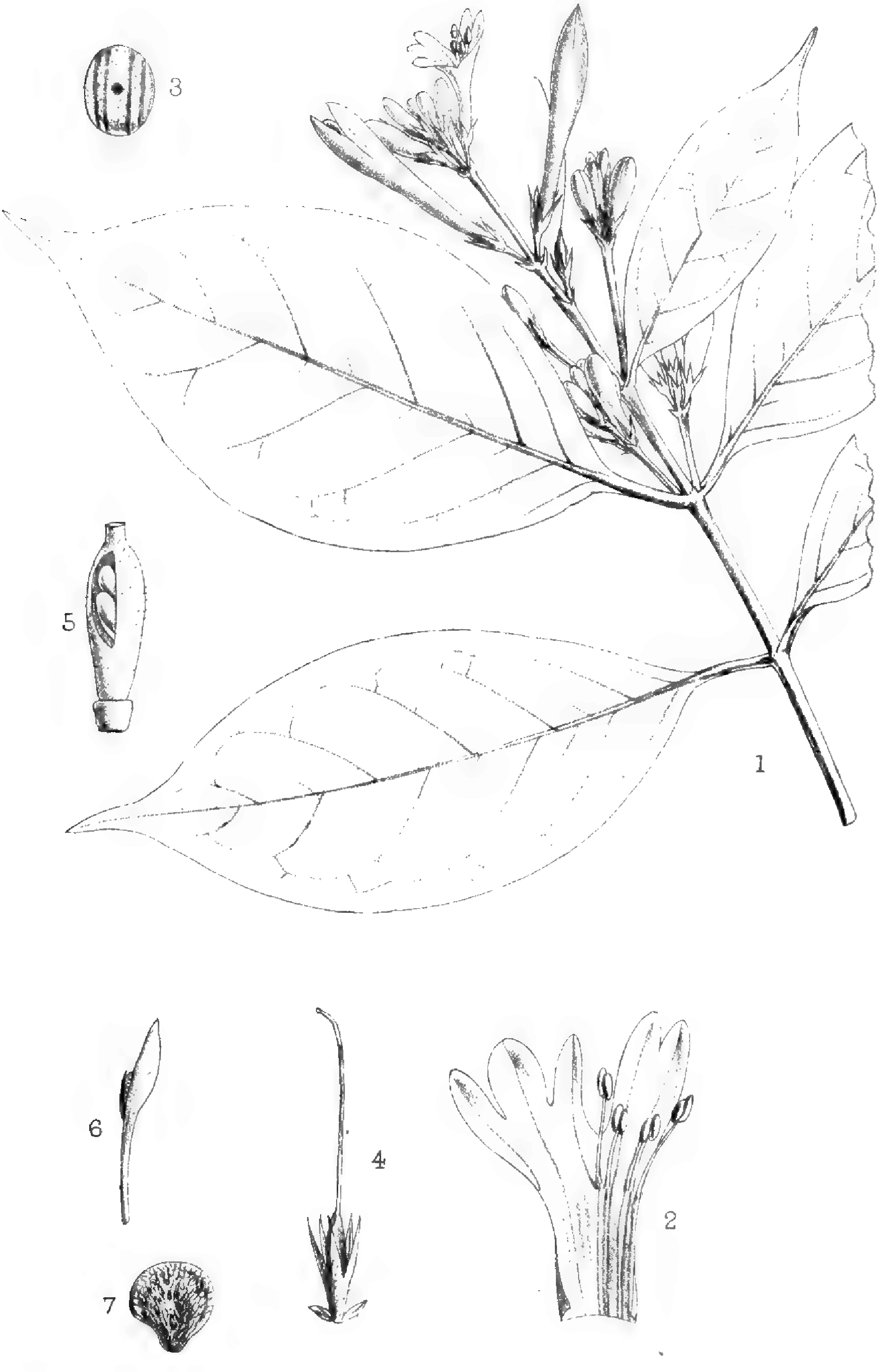
Fig. 1. Portion of branch with male inflorescence, nat. size.
2. Stipule, enlarged.
3. Male flower, enlarged.
4. Back view of male flower, enlarged.
5. Stamen, enlarged.
6. Capsule, enlarged.
7. Diagram of tetramerous male flower: *a*, rudimentary ovary; *b*, stamen; *c*, gland; *d*, petal; *e*, sepal.

1
2
3
4
5
6
7
a
b
c
d
e

Baker fil. anal.
J. N. Fitch lith.
West, Newman imp.

TRIMERIA MACROPHYLLA, *Baker fil.*

S. Moore. LINN: SOC. JOURN. BOT. VOL. XXXVII. Pl. 2.



S. Moore del.
J. N. Fitch lith.
West, Newman imp.

STYASASIA AFRICANA, *S. Moore*

Rendle. LINN. SOC. JOURN. BOT. VOL. XXXVII. Pl. 3.

A.B. Rendle anal.
J.N. Fitch lith.

West, Newman imp.

ERYTHROCOCCA PAXII, *Rendle*.

J.N. Fitch lith.   West, Newman imp.

HAEMANTHUS RADCLIFFEI, *Rendle.*

PLATE 2.

STYASASIA AFRICANA, S. Moore.

Fig. 1. Branch, with leaves and inflorescence, nat. size.
2. Flower, laid open, enlarged.
3. Pollen-grain, highly magnified.
4. Calyx, with bracts, ovary, and style, enlarged.
5. One cell of ovary opened, showing ovules, enlarged.
6. Fruit, showing seed, enlarged.
7. Seed, magnified.

PLATE 3.

ERYTHROCOCCA PAXII, Rendle.

Fig. 1. Branch with male flowers, nat. size.
2. do. female flowers, do.
3. Male inflorescence, enlarged.
4. Single flower of same, magnified.
5. Stamen, magnified.
6. Female inflorescence, enlarged.
7. Young fruit, enlarged.
8. Ripe fruit dehiscing, enlarged.
9. Seed, magnified.

PLATE 4.

HÆMANTHUS RADCLIFFEI, Rendle.

Natural size.

The Axillary Scales of Aquatic Monocotyledons. By R. J. HARVEY GIBSON, M.A., F.L.S., Professor of Botany in the University of Liverpool.

[Read 6th April, 1905.]

(PLATES **5** & **6**.)

DURING the course of an investigation into the anatomy of certain species of *Selaginella* (**1**), I had occasion to compare the origin and development of the ligule of that genus with that of *Isoëtes*, and suggested a possible function for the structure in question. The ligule appeared to me to be of the nature of a specialised ramentum, such as one finds so frequently in Filicineæ, protecting and keeping moist the young leaves and growing apex. This view was based on the contents of the cells of which it was composed, the large vascular supply and its history in relation to the leaf with which it is associated.

That the ligule is of considerable phylogenetic importance I think cannot be doubted, although its functional importance in recent forms may perhaps be regarded as secondary. Its occurrence in fossil Pteridophyta seems to have been widespread, as shown by the researches of Hovelacque (**2**), Maslen (**3**), Scott (**4**), and others. In view of the frequently expressed suggestion that the aquatic Monocotyledons may be looked upon as modern representatives of the more primitive Angiosperms, and that these in turn may have been genetically related to the ancestors of such types as *Isoëtes*, it occurred to me that it might be worth while to enquire into the structure of any vestigial members present in aquatic Monocotyledons which might suggest affinity with such problematical ancestors. The axillary scales known to occur in many Helobieæ presented themselves as appropriate subjects for investigation, and the present paper embodies the results of an examination both of the adult structure and of the development of these structures in the following genera:—

Potamogetonaceæ: *Zostera* (*Z. marina* and *Z. nana*), *Potamogeton* (*P. perfoliatus* and *P. crispus*), *Ruppia* sp.
Aponogetonaceæ: *Aponogeton distachyon*.
Juncaginaceæ: *Triglochin* (*T. maritimum* and *T. palustre*).
Alismaceæ: *Alisma* (*A. Plantago* and *A. ranunculoides*), *Sagittaria sagittifolia*.

Butomaceæ: *Butomus umbellatus, Limnocharis* (*Hydrocleis*) *nymphoides.*

Hydrocharidaceæ: *Halophila ovata, Stratiotes aloides, Hydrocharis Morsus-ranæ, Vallisneria spiralis.*

I desire to express my indebtedness to Professor I. Bayley Balfour, F.R.S., and Mr. A. C. Seward, F.R.S., for material of some of the rarer species.

ZOSTERA.

In *Z. marina* the bases of the older leaves form complete sheaths for some distance upward from their origin, the combined series forming a very much flattened ellipse in section. On one side the sheathing base is thin and parenchymatous, on the other thick, and contains several vascular strands. The thicker and thinner regions of successive sheaths alternate. The axillary scales (first described by Bornet (**5**)) occur at the margins of the ellipse, usually two, three, or four at either margin. The scales vary much in size, some being quite minute. There are no scales along the flat sides of the ellipse, save occasionally in the case of the younger, more central leaves. Adjacent scales frequently interlock so that the bluntly rounded edge of one scale is embraced by two flange-like ridges of the other. The appearance in section thus suggests a ball-and-socket joint (Pl. **5**. fig. 2). Each scale consists of a pedicel of cells six to eight rows in thickness, polygonal in sectional outline and taking on a deeper stain than the remaining cells of the scale, which are long and narrow (Pl. **5**. fig. 4).

In development the ridge from which the scales arise is multicellular from the commencement, and in this respect as well as in general shape the scale resembles closely the ligule of *Selaginella.* There is, however, no special basal layer such as I have described as occurring at the base of the ligule in that genus.

In *Zostera nana* the axillary scales are quite similar in appearance. Usually, however, there is only one scale situated at either margin of the ellipse. The vascular strands of the leaf run very close to the base of the scale, separated from it, in fact, by only 2–3 layers of thin-walled parenchyma, but in no case is there any enlargement or expansion of tracheides into a vascular cup, so prominent a feature in many species of *Selaginella.* The scales in *Z. nana* are much shorter than in *Z. marina* and show a narrower pedicel, enlarging into a basal region 8–10 cells thick, which tapers gradually into unilamellar margins and apex.

POTAMOGETON.

The axillary scales in *Potamogeton perfoliatus* differ markedly from those of *Zostera*, being in the form of plates of parenchymatous cells, usually two cells in thickness throughout the greater part of their extent, and extending laterally in the leaf-axil for a distance of about two-thirds of the insertion of the leaf. Developmentally the scale arises from a single row of cells (Pl. **6.** fig. 7), which very soon divides into two layers (fig. 8). Distally these mitral cells divide frequently, until at a short distance from the axil the scale becomes 6–8 cells thick. The remainder—by far the greater part—of the scale is two cells in thickness, becoming at the apex unilamellar. The vascular bundle entering the leaf, although it does not show any tracheidal cup, thickens slightly by developing in that situation one or two short accessory tracheides.

In *Potamogeton crispus* the axillary scales are much smaller, but are identical in general character with those of *P. perfoliatus*. Their bases also are not so much swollen.

The general features of the scales in this genus were first described by Irmisch in 1858 (**6**).

RUPPIA and APONOGETON.

In an unnamed species of *Ruppia* from Rodriguez, collected by Prof. Bayley Balfour, and in *Aponogeton distachyon* the scales are solitary in the axils of each leaf and arise from a double row of initial cells. Older scales in *Aponogeton* show a certain amount of cutinization of the basal cells of the scale, a feature to which I will refer under *Hydrocharis*.

Dutailly (**7**) records the occurrence of scales (in *Aponogeton*) in the axils of consecutive leaves, and speaks of them as exhibiting intercalary growth. This mode of growth is common to all cases which I have examined.

TRIGLOCHIN.

In *Triglochin maritimum* the axillary scales are large and broad, and arise from the base of the sheath of the leaf rather than from the axil. In the allied species *Triglochin palustre* the scales are more of the type seen in *Potamogeton* and the basal cells of older scales show marked cutinization.

ALISMA.

Transverse sections of young shoots of *Alisma Plantago* exhibit an appearance such as that represented in fig. 1, Pl. **5**, where the bases of the sheathing-leaves are seen to be separated from each other by numerous multicellular plates. The number of scales between each pair of leaves is very variable. I have counted as many as 27, but the usual number appears to be from 10 to 15. The distance apart of the scales varies with the level of the section and the age of the shoot, and it would appear from that fact, as also from other evidence, that the scales in process of growth become divided into smaller and smaller segments. Each scale is an elongated ramentum-like plate (fig. 14, Pl. **6**) consisting of one layer of slightly prosenchymatous cells, ending in a more or less blunt or truncated apex. The basal cells next the axil are parenchymatous and in early stages are merismatic. In longitudinal sections of the growing apex (fig. 3, Pl. **5**, & fig. 12, Pl. **6**) the scales are seen to be produced by segmentation of a single row of axillary cells, the free segments so formed themselves segmenting into a distal series which gradually elongate to form the plate-cells, whilst the proximal cells again undergo division, adding to those already formed.

Although the majority of the scales in *A. Plantago* arise singly, still not infrequently scales arise from two or more rows of cells concentrically placed. The appearance is then suggestive of a bi- or even multi-lamellar origin, until the further evolution of the scales is traced, when it is seen that each row has an independent development and results in the formation of two or more concentrically placed scales in each axil, a condition quite common in the allied species *A. ranunculoides* (Pl. **6**. fig. 17). Rarely the separation of the initial layers does not take place for some time, and the bases of two and even more scales may then be said to show congenital fusion. In *A. ranunculoides* the normal condition, at least in the young state, is that showing in transverse section two or more rows of scales abreast, and this is confirmed by examination of longitudinal sections. The mode of development, however, does not appear to differ from that just described in *Alisma Plantago*. Scales are entirely wanting between the floral leaves of both species.

SAGITTARIA.

The axillary scales in *Sagittaria sagittifolia*, described by Nolte so long ago as 1825 (**8**), are very numerous, as evidenced both by dissection and by transverse sections. Each scale begins as a multicellular ridge, 6–12 rows in thickness (Pl. **5**. fig. 5). Each epidermal cell or cell-row gives rise by transverse division to a filament or plate which may remain distinct, or, as is more usual, grow in conjunction with other cell-rows or plates for a considerable distance, finally separating into numerous free filaments or plates. In consequence the closely packed young leaves are surrounded on all sides by succulent cellular threads or masses.

BUTOMUS.

In *Butomus umbellatus* the bases of successive leaves are separated by numerous filamentous scales, some thread-like, others two or more cells broad, arranged and developing in a manner quite similar to those of *Alisma Plantago*. Indeed, fig. 12, Pl. **6**, might stand for a longitudinal section of the base of an axillary scale of *Butomus* as well as for that of *Alisma*.

HYDROCLEIS.

The axillary scales in *Hydrocleis nymphoides* recall those of *Sagittaria* both in structure and mode of development. Each scale arises from a multicellular axillary ridge, and the cell-rows separate distally into numerous elongated plates or filaments. In consequence of the crowded arrangement of the scales the young leaves, as in *Sagittaria*, appear as though completely imbedded in a parenchymatous mass. The nuclei of the cells of the scales are long, rod-shaped, and deeply stainable. Dutailly (**9**) describes axillary scales in *Hydrocleis Humboldtii*, and remarks that they completely envelop the young leaves, acting as a protective sheath and arising soon after the leaves themselves.

HALOPHILA.

The genus *Halophila* has formed the subject of an exhaustive memoir (**10**) by Prof. Bayley Balfour, in which the morphology of "squamulæ intervaginales," as the axillary scales were called by Irmisch, is discussed. To this I shall have occasion to refer later.

The scales are solitary in the axil of each leaf, arising from a double row of initial cells and maintaining that thickness throughout save at the extreme margins, where they are unilamellar. The leaf possesses a relatively massive median vascular bundle, and the scale, at first central in position, takes up later an oblique position opposite one of the thinner lamellæ of the leaf, or forks into two wings one on either side of the midrib. Balfour (**11**) elsewhere describes the existence of *an* axillary scale, and points out that though at first median it attains later a lateral position. In the memoir above referred to (**10**) he says "there are two of these (scales) at the insertion of every leaf placed one on either side of its base." These two somewhat divergent statements may perhaps be reconciled by the scale sometimes splitting, sometimes remaining entire.

STRATIOTES.

The scales in *Stratiotes aloides* are most variable in number owing to their frequent division. As an example, I may give the number of scales in the first twenty leaves of the bud in a case in which the scales were counted:—

I= 2 : II= 7 : III= 7 : IV= 9 : V= 8 :
VI=10 : VII= 7 : VIII= 7 : IX= 9 : X=10 :
XI= 9 : XII=13 : XIII=11 : XIV=13 : XV=13 :
XVI= 8 : XVII=14 : XVIII= 9 : XIX=12 : XX=11.

The scales appear to arise from a ridge of three or four cells, and maintain that thickness for some distance above the point of origin (Pl. **6**. fig. 13). The main body of the scale is two layers in thickness, reduced at the free end to one layer. [The spaces between the closely-packed leaves are the abode usually of countless numbers of nematode worms.]

HYDROCHARIS.

Two or three massive scales appear in each leaf-axil of *Hydrocharis Morsus-ranæ*, resembling in appearance those of *Stratiotes*. One peculiarity worthy of note is the early cutinization of the basal cells of the scale, which then stand out prominently. As cutinization progresses the cell-contents, at first very prominent and taking on a deep stain, gradually disappear. In old scales the cells are quite empty (Pl. **6**. fig. 11). The upper part of the scale then drops off, leaving a cutinized ridge only. The cutin is first deposited in the radial walls of the basal cells and gradually extends to the other walls of these and neighbouring cells. The general appearance recalls the sheathing-cells of the glossopodium of the ligules of *Selaginella*. The same phenomenon is noticeable in the basal cells of other genera, notably *Triglochin* and *Aponogeton*.

VALLISNERIA.

Two to five somewhat massive scales occur in the axil of each leaf of *Vallisneria spiralis*. Each arises from a ridge three cells in thickness, rapidly dividing so that the scale becomes finally about 5–6 cells thick. This thickness it maintains for most of its length. Müller (**12**) speaks of the development of the scale as being due to the activity of an apical cell-row. The mode of growth, however, appears to me to be, as in other forms, invariably basal. I have never seen any evidence of apical growth in any of the axillary scales I have examined.

The Morphology and Physiology of Axillary Scales.

Speculations as to the morphological value and physiological purpose of axillary scales are not wanting. The subject was discussed by Irmisch (**6**) in 1858, afterwards by Prillieux (**13**) and by Balfour (**10**), and yet in 1882 Buchenau writes: "Ueber ihre morphologische und physiologische Bedeutung sind wir noch immer im Unklaren." Irmisch (**6**) holds that the axillary scales are trichomic, and considers that they are protective organs to the merismatic structures in their vicinity. Prillieux, on the other hand, inclines to the belief in a stipular homology for them. Balfour (**10**) steers a median course, suggesting that from "position and development" they may be in *Halophila ovalis* designated as "stipules," but doubtfully so in *H. stipulacea*, which possesses membranous wings on either side of the petiole in addition to the axillary scales. He decides to retain Irmisch's name "as indicating a special form of structure, whatever be its morphological value."

My own view is that these axillary scales are homologous with the more specialised and solitary ligules of *Selaginella*, of *Isoëtes*, and of such fossil forms of Pteridophyta as *Lepidodendron*, where the presence of a ligule was demonstrated by Solms-Laubach (**15**) and by Hovelacque (**2**), and in *Lepidostrobus*, where a ligule is described by Maslen (**3**).

Without unduly emphasising minute anatomical detail, I would draw attention first to the close resemblance between the figures showing early developmental stages in the scales of *Potamogeton* and *Alisma* (Pl. **5**. fig. 3 & Pl. **6**. figs. 7, 8), and those of corresponding stages in the ligules of *Selaginella* figured both by Bower (**16**) and by myself (**1**). In the paper referred to (**1**) I laid stress on certain peculiarities seen in the ligules of *Selaginella*, more especially (*a*) the close association of the ligules with the young leaves and growing apex; (*b*) the deeply stainable contents of the ligular cells in the young condition especially; (*c*) the ultimate isolation of the ligule by cutinization of its basal cells; (*d*) its early appearance and early decay; (*e*) its variable form and state of development; and lastly (*f*) its probable homology with a ramentum. In all these characters the scales described above show a strong family likeness. The scales are almost simultaneous in development with the leaves, their cells are deeply stainable, they contain abundant protoplasm, they show the same merismatic basal layer, the same development of an isolating cutinization in the basal cells when their merismatic functions have ceased. There are, it is true, points of difference, the chief of which are (*a*) the non-differentiation of a special glossopodium, and (*b*) the non-development of any vascular dilatation of the leaf-trace below their point of origin. These differences, however, do not appear to me to form insuperable difficulties in establishing the homology I desire to make out; since in the first place histologically differentiation has not reached a very high level in aquatic monocotyledons, and in the second place, being aquatic and in the young condition even submerged plants, there would appear to be no necessity for any enlargement of the, in itself, feebly developed leaf-trace in the vicinity of the leaf-rudiments. If the term "stipule" has been made to include, as Balfour says (**10**. p. 14), both "a lateral branch of a leaf arising at its very point of insertion" as well as "structures organically connected with the stem," or, in a word, "any small appendicular structures found in the vicinity of the base of the leaf," we are, I think, in danger, by over-dependence on the connotation of a term, to lose sight of what may ultimately prove to be important homologies. The discovery of the occurrence of a ligule in the Lepidodendreæ leads Scott (**4**) to assert the probable affinity of that group "with *Selaginella* or *Isoëtes*, rather than with *Lycopodium*, among recent members of the order." There is no desire, so far as I am aware, to homogise the "stipules" of *Marattia* with the ligules of the Selaginellaceæ; and I scarcely think the lateral displacement of the scales in such a type as *Halophila* justifies us in drawing more than an analogy between them and the stipular leaf-appendages so rare in leaves with broad insertions, but so common a feature in dicotyledonous morphology.

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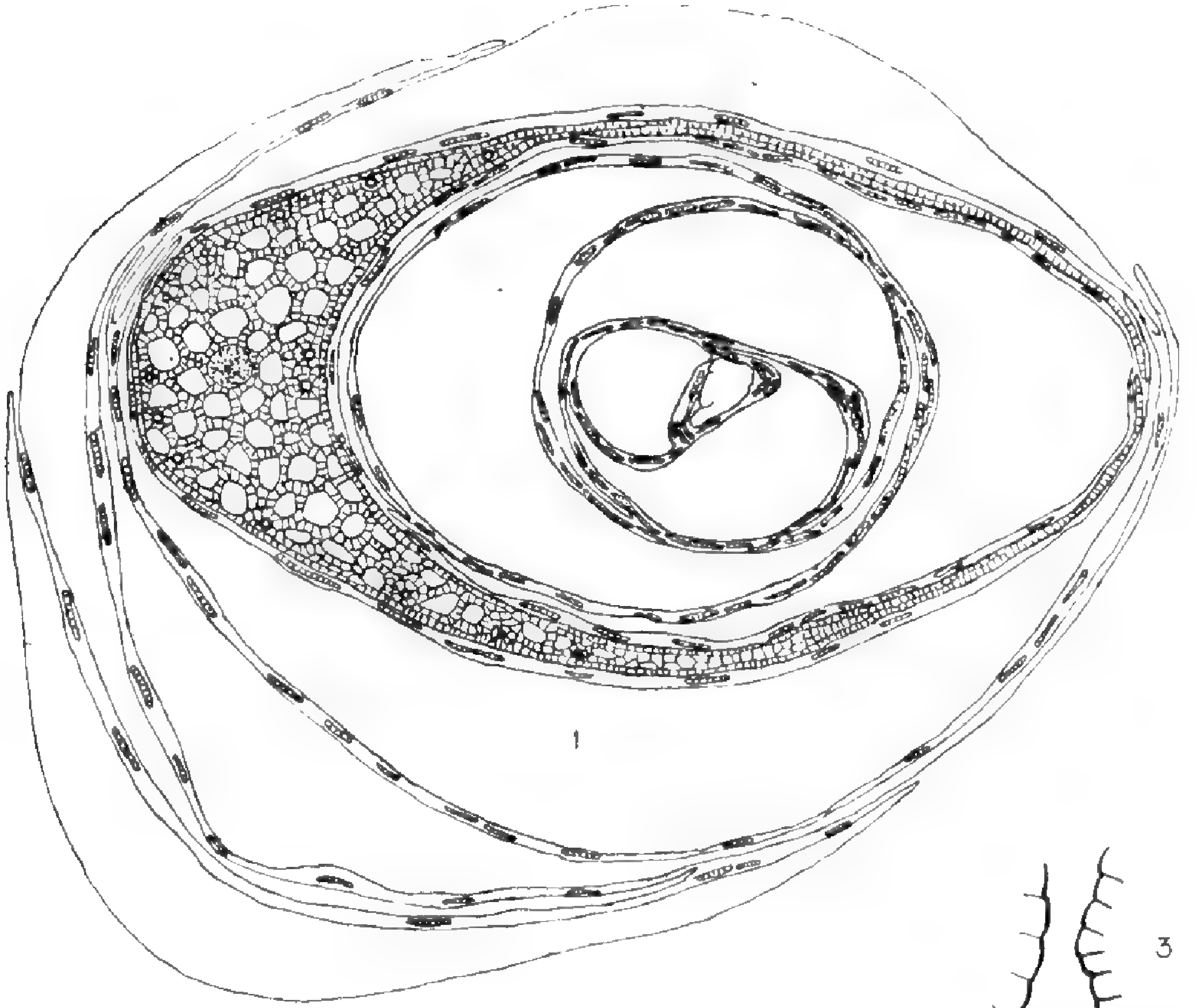
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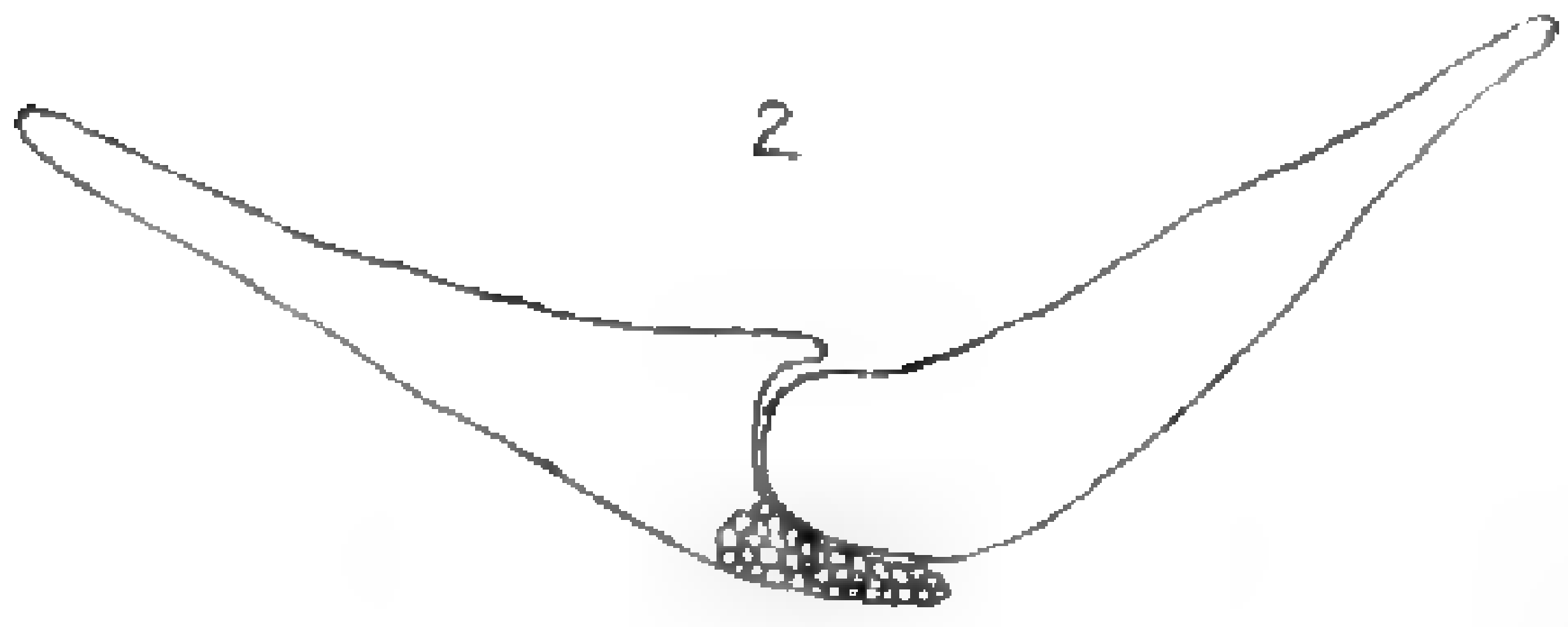
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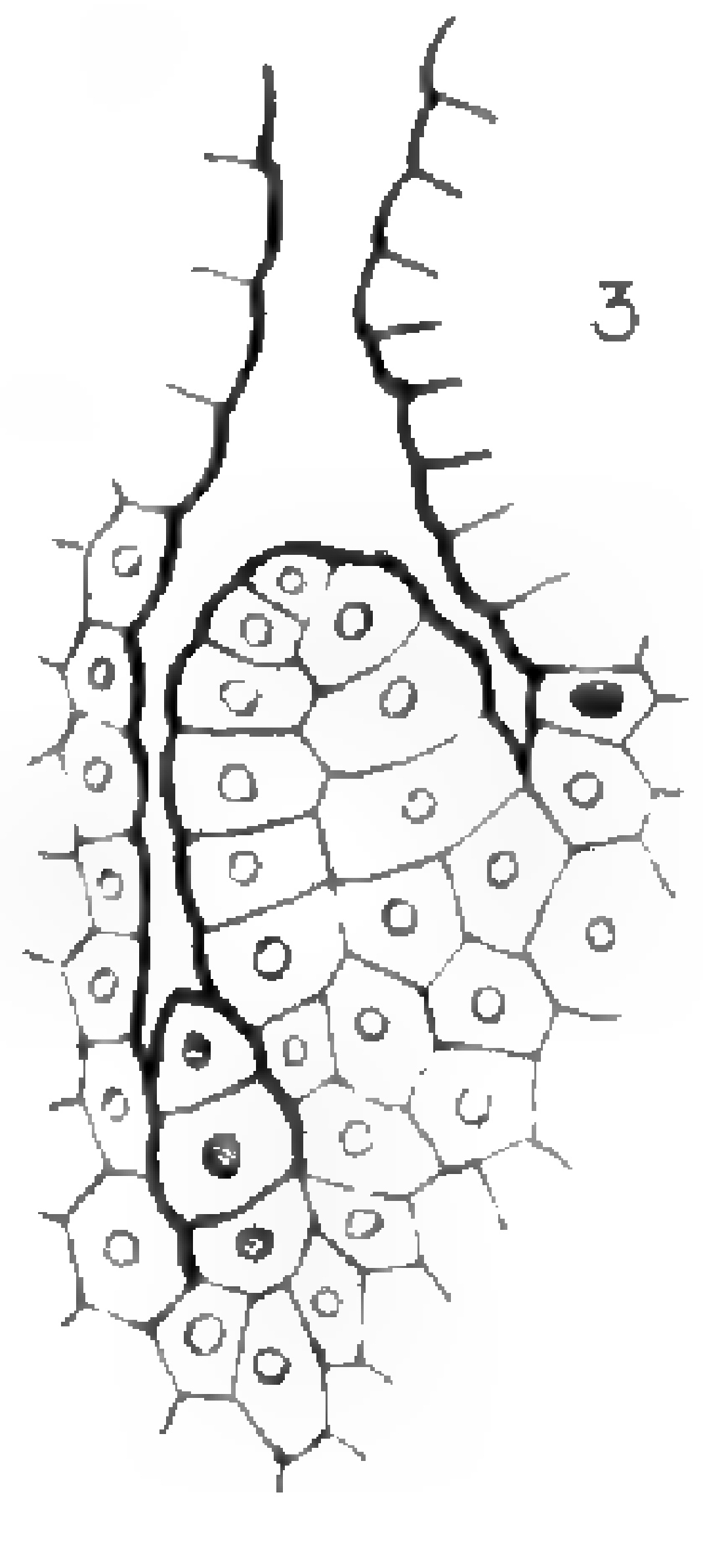
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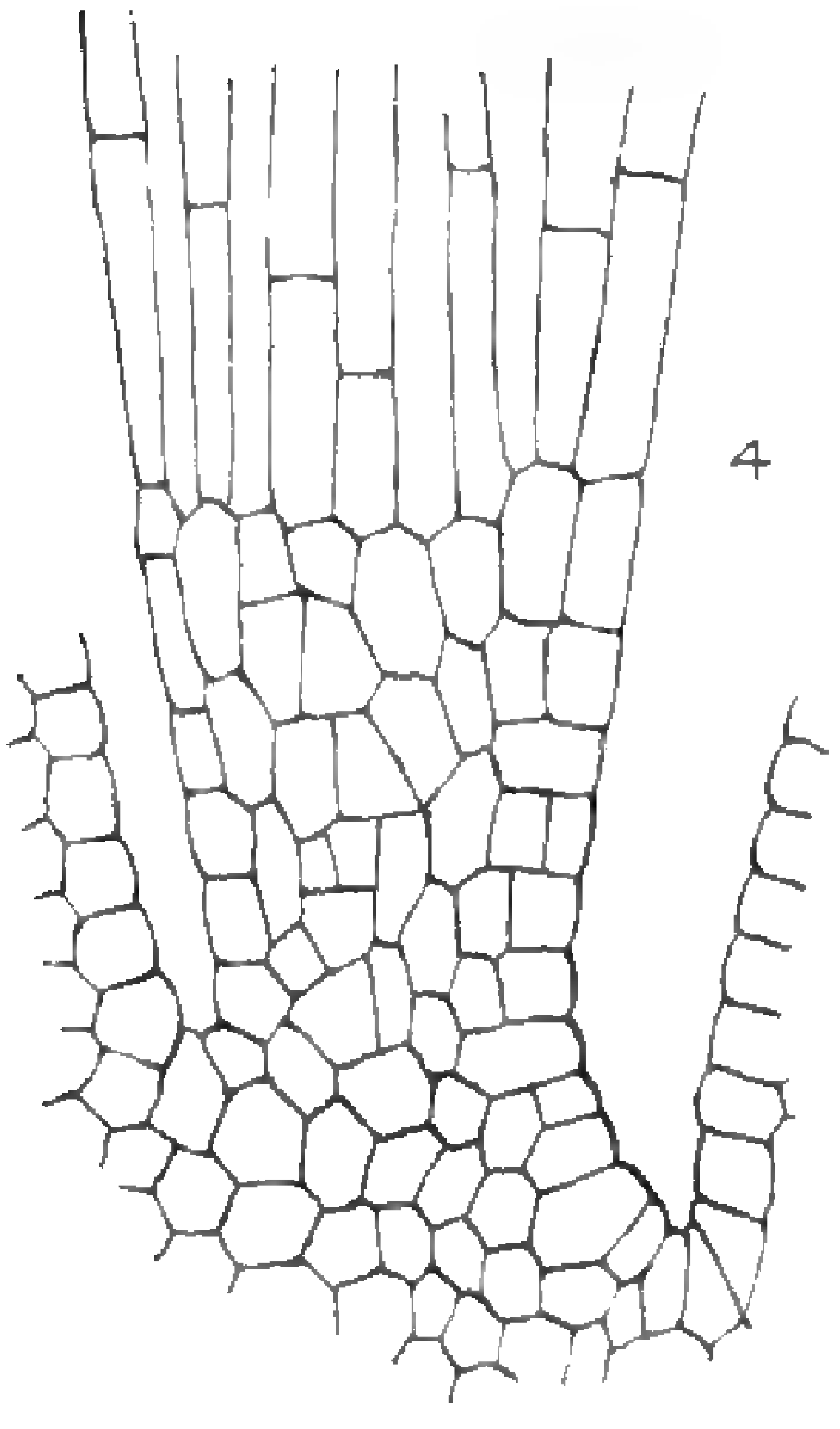
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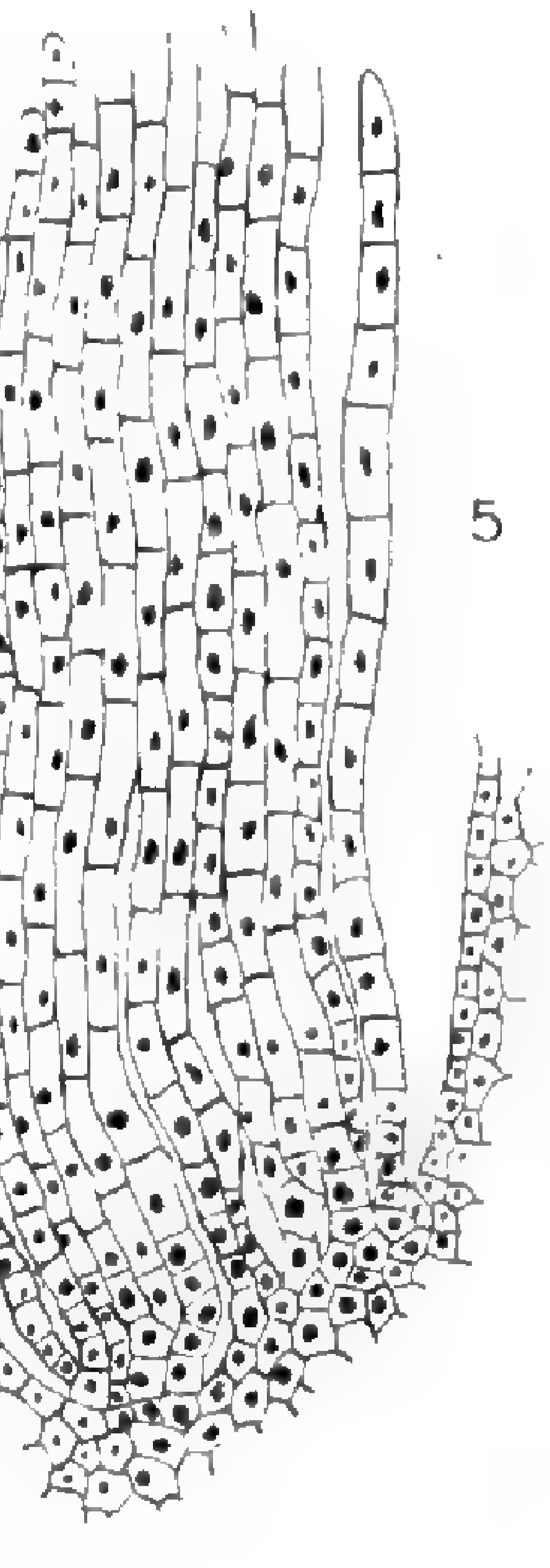
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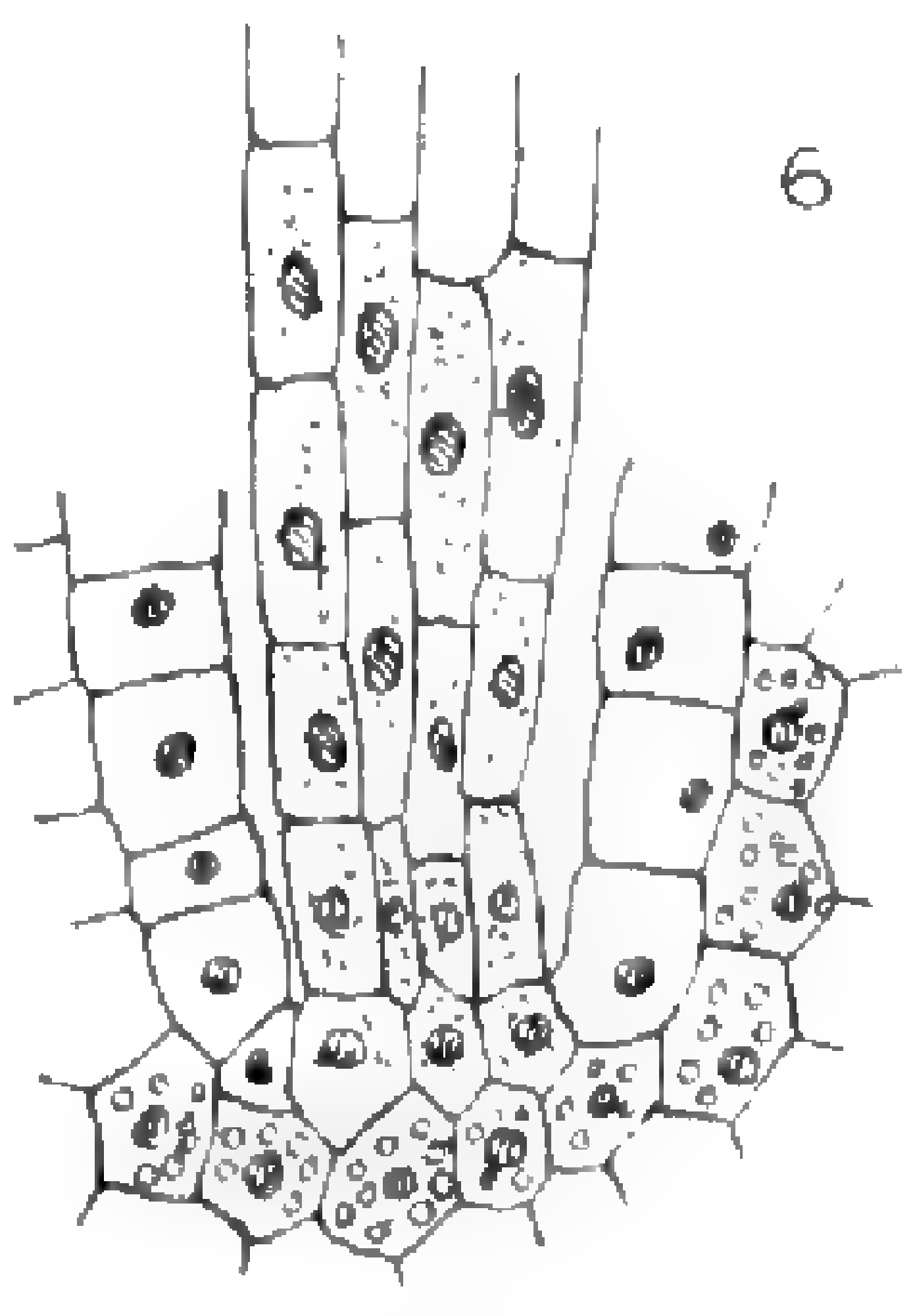
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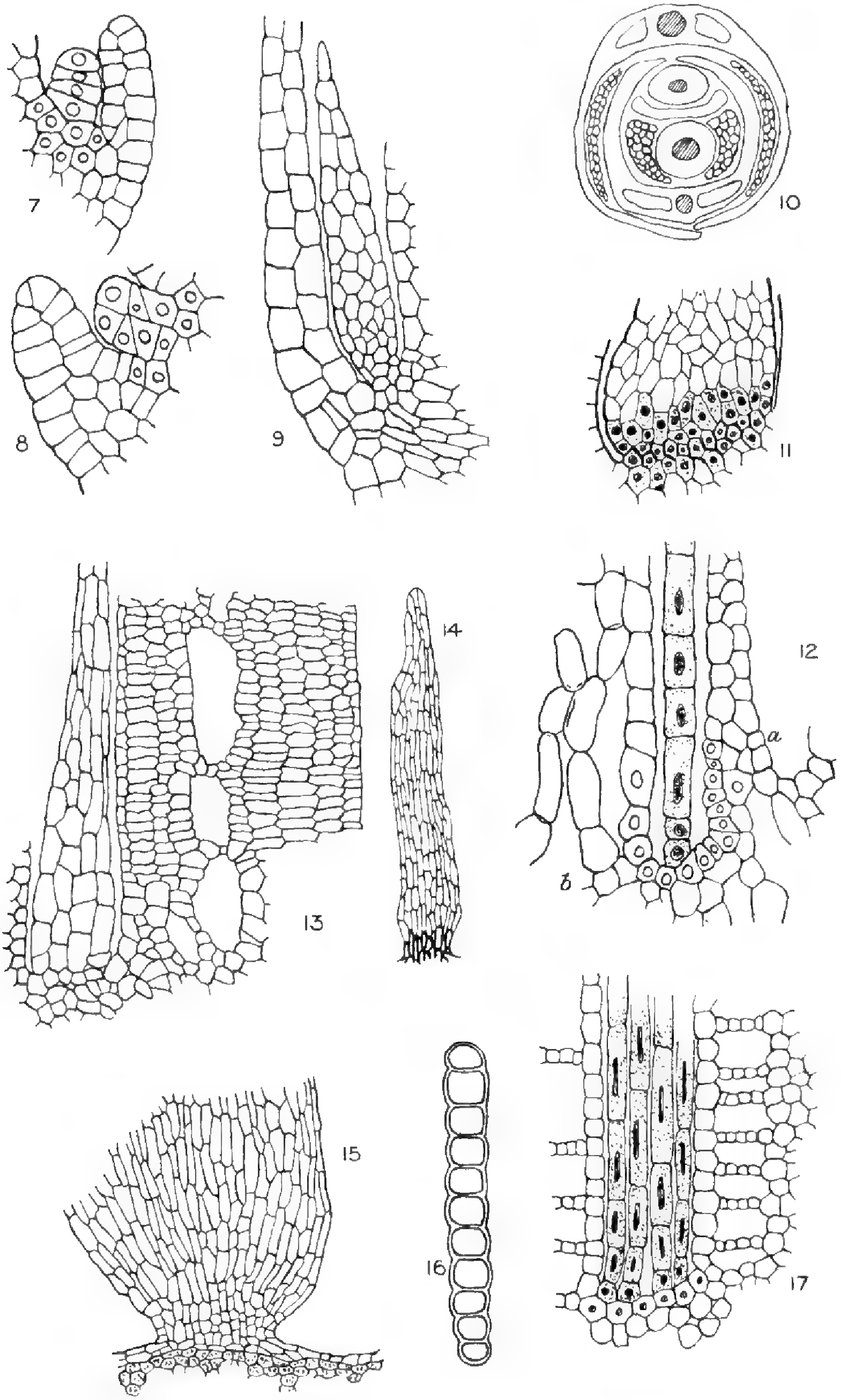
AXILLARY SCALES.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R. J. H. Gibson, del. T. P. Collings, photosc.

AXILLARY SCALES.

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EXPLANATION OF THE PLATES.

Plate 5.

Fig. 1. Transverse section of a young shoot of *Alisma Plantago*, showing numerous axillary scales between the leaves. × 30.

2. "Ball-and-socket" association of adjacent scales in *Zostera marina*. × 350.

3. Longitudinal section of the apex of *Alisma Plantago*, showing an early stage in the development of the leaf and of the axillary scale of the subjacent leaf (to the left); the earliest stage in the development of the scales is indicated by the cell with shaded nucleus to the right of the young leaf. × 550.

4. Longitudinal section of the base of the scale in *Zostera marina*. × 550.

5. Longitudinal section of the base of the scale in *Sagittaria sagittifolia*. × 350.

6. Longitudinal section of the base of the scale in *Vallisneria spiralis*. × 550.

Plate 6.

Figs. 7 & 8. Two stages in the development of the scale in *Potamogeton perfoliatus*. × 550.

Fig. 9. Older stage of the same, showing the entrance of a procambial strand into the leaf-base. × 550.

10. Transverse section of the apex of *Ruppia* sp. The anatomical features of the axillary scales only are indicated. × 75.

11. Partially cutinized cells (with dark outlines) of the base of the scale of *Hydrocharis Morsus-ranæ*. × 550.

12. Longitudinal section of the leaf-base of *Alisma Plantago*. The wing-like expansion of the leaf is shown at *a*; the base of an older leaf at *b*; the axillary scale is figured in the centre as arising from a single cell-row (cells shaded). × 550.

13. Longitudinal section of the base of the leaf and scale of *Stratiotes aloides*. × 350.

14. A small scale of *Alisma Plantago* on face-view. × 75.

15. Base of the scale of *Sagittaria sagittifolia* on face-view. × 350.

16. A small scale of *Alisma Plantago* in transverse section. × 550.

17. Longitudinal section of the base of the leaf of *Alisma ranunculoides*, showing the concentric origin of scales. × 550.

THE BOTANY OF GOUGH ISLAND.—I. Phanerogams and Ferns. By R. N. RUDMOSE BROWN, B.Sc., Botanist of the Scottish National Antarctic Expedition. (Communicated by Mr. W. BOTTING HEMSLEY, F.R.S., F.L.S.)

[Read 4th May, 1905.]

(PLATES 7–9.)

GOUGH ISLAND, or Diego Alvarez, which lies in the mid-South Atlantic (Lat. 40° 20′ S., Long. 9° 56′ 30″ W.), may be regarded as the most outlying island of the Tristan da Cunha group. It lies S.E. by S. about 220 miles from Nightingale Island, the nearest island of the group.

It is a small island some 7 or 8 miles in a northerly and southerly direction and 3 or 4 miles east and west. It rises to a height of about 4000 feet.

The island has never been permanently inhabited, though the islanders of Tristan da Cunha appear to have occasionally visited it according to Mr. Moseley *.

From August 1888 to January 1889 a party of twelve men belonging to a New London sealing schooner lived there. One of these men (George Comer), who appears to have had some knowledge of science, besides bringing home some bird-skins and eggs, kept a diary in which are a few notes relating to plants. Comer † says "there are two kinds of trees, though while one is plentiful, the other is quite scarce. The grass and brakes grow very rank." "Wood is plentiful. The trees are stunted, but quite thick in some places on the island." "The trees retain their leaves the year round." "The thick bushes extend to an elevation of about 2000 feet." The tree referred to is no doubt *Phylica nitida*, while possibly the other "tree" is the tree-fern *Lomaria Boryana*. Comer also states that he found some potatoes growing wild "where there used to be a camp of sealers 18 years ago." Near the landing-place, on what is apparently the only piece of level ground near sea-level, ruins of one or two huts are to be seen. These, I afterwards found at Cape Town, had been inhabited in the year 1892 by a party of sealers from South Africa who had spent thirteen months on the island. The sealing had proved a comparative failure, and they had not returned. South-Sea whalers have occasionally touched here and even brought back collections of birds and rocks, but no plants seem to have been gathered. These whalers, chiefly American, are no doubt responsible for several introduced plants on the island. All that was previously known of the botany of Gough Island was the statement of the Tristan da Cunhans that *Phylica* grew there, and that several of the other plants were similar to the Tristan species.

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* Moseley, Journ. Linn. Soc., Bot. xiv. (1874) p. 384.

† Verrill, Trans. Conn. Acad. ix. (1895) pt. ii. p. 432.

The Scottish National Antarctic Expedition, on its return from the Antarctic Regions in April 1904, made a stay of three days off this island; but only on one (April 22nd) was it possible, owing to the high sea running, to effect a landing, and even on that day it was only accomplished with difficulty. The extremely bad anchorage and the squally nature of the wind made it imperative that the shore party should keep within easy reach in the event of a sudden recall being necessary. This was unfortunate, as it prevented a visit to the higher ground, where several other species might have been found. On approaching the island one is struck by the amount of green to be seen: from the highest summit to the water's edge it seems to be clothed with vegetation, and even the steepest precipices, in which the land usually meets the sea, have their covering of moss.

Rainfall is probably great, as evidenced in the cascades of water pouring over the cliffs on all sides. Comer * notes incessant strong gales with mist, rain, and snow in the meteorological log he kept while on the island, but he apparently took very few readings of the air-temperature. Probably, however, the climate of Gough Island is very similar to that of Tristan da Cunha, where the temperature varies from 48° F. in winter to 74° F. in summer, and the precipitation is excessive the whole year round. At the time of our visit there was no snow-cap on the summit.

On the eastern side of the island a torrent coming down to the sea has cut a deep glen, and this seems to afford the only practicable road to the interior. It was here that a landing was effected †.

On landing one notices the rankness of the vegetation. Above high-water docks (*Rumex frutescens*) and the wild celery grow in luxuriant profusion, and in more stony ground I found several plants of the sow-thistle (*Sonchus oleraceus*)—these latter in flower. The tussac-grass (*Spartina arundinacea*) was not, at the place of landing, so abundant as in other parts of the coast, but here and there on the hillsides down to sea-level there were large tufts of it. In habit it is very similar to the tussac-grass of the Falkland Islands, but does not appear to grow in such masses as to almost entirely exclude other plants as it does on those islands. The only sward-forming "grass" seems to be *Scirpus* (spp.): on the southern side of the stream was about half an acre of this, making a rich pasture. Other grasses are to be found, but growing in more isolated tufts. The characteristic tree of the Tristan da Cunha group (*Phylica nitida*) is well represented, and grows on Gough Island from about 2000 feet to sea-level, but above 100 feet it is most plentiful. The tree grows some 20 or 30 feet in height even on the most exposed ridges. The stems are not very thick, not more than 10 to 12 inches, and the branches are long and straggling, with leaves only at the extreme ends. Most of the branches are thickly encrusted with lichens. Tree-ferns grow in the rich ground beside the stream, and reach a height of 4 feet or more. The beach is thickly strewn with water-worn stems of these ferns, which have probably been brought down by the stream when in spate, carried into the sea and washed up on to the beach. Several species of ferns grow in nooks and crannies of the moist rocks, and apparently easily obtain a footing in the relatively soft volcanic ash. Mosses are plentiful everywhere, and in the bed of the stream I got several specimens of a liverwort.

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* Verrill, Trans. Conn. Acad. ix. (1895) pt. ii. p. 471.

† For a fuller account of Gough Island, see Scot. Geog. Mag. xx (1905) p. 430.

The only plants in flower were *Sonchus oleraceus* and *Apium australe* and two species of *Rumex*, and the majority of even these were in seed. *Gnaphalium pyramidale* bore withered flowers, and *Phylica nitida* and *Empetrum nigrum*, var. *rubrum*, were in fruit in a few places.

I found no trace of any plants introduced for cultivation by the settlers whose ruined huts we found. Beyond the huts was half an acre of ground beset with tree-stumps, the remains, no doubt, of the native tree which they had cut down for firewood.

The plants of Gough Island have, as might be expected, proved to be very similar to those of Tristan da Cunha. The present collection contains seventeen species of phanerogams and ten of ferns. Four of the seventeen species of phanerogams are almost without doubt introduced (*Hypochœris glabra*, *Sonchus oleraceus*, *Rumex obtusifolius*, and *Plantago major*). Of the remaining 21 species of Gough Island plants, eighteen are recorded from Tristan da Cunha—one (*Hydrocotyle leucocephala*) is a South-American plant and two are endemic (*Cotula* sp. nov. and *Asplenium* sp. nov.). Of the eighteen species also recorded from Tristan da Cunha, four certainly, and probably six, are endemic to the group. The mosses, liverworts, lichens, and fungi, the determination of which is not quite complete, will form the subject of a second paper. In conclusion, I have to thank the authorities at Kew and the British Museum for the facilities granted me for working in their herbaria. To Mr. C. B. Clarke I am particularly indebted for his determination of the species of *Scirpus*, and I would express my thanks to Mr. A. N. Bruce, B.Sc., for the care and trouble he has taken in the drawing of Plate **9** accompanying this paper.

DICOTYLEDONES.

Phylica nitida, *Lam. Encycl.* ii. p. 77; *DC. Prodr.* ii. p. 35; *Hemsl. Chall. Bot.* i. ii. p. 148, t. 25. P. arborea, *Thou. Esq. Fl. Trist.* p. 45. P. mauritiana, *Boj. ex Baker*, *Fl. Maurit.* p. 53.

Very common on the island up to a height of about 2000 feet, growing even on the most exposed ridges. It seldom grows more than some 25 feet in height, and the stems are always much bent and gnarled and generally covered with a growth of lichens.

Distribution. Tristan da Cunha, Inaccessible and Nightingale Islands, Amsterdam Island, Reunion and Mauritius.

Hydrocotyle leucocephala, *Cham. et Schlecht. in Linnæa*, i. (1826) p. 364.

Common in the glen in swampy places under waterfalls. This species differs from *Hydrocotyle capitata*, Thouars—the Tristan da Cunha plant—in the almost total absence of hairs on the leaves and leaf-stalks, except an occasional sparse covering near the blade.

Distribution. Brazil and Paraguay. This species does not appear to have been recorded outside of these two countries.

APIUM AUSTRALE, *Thou. Esq. Fl. Trist.* p. 43; *Hook. f. Handb. Fl. N. Zeal.* p. 90; *Hemsl. Chall. Bot.* i. II. p. 149.

Common on the low-lying ground down to high-water mark and growing very rankly in places. It appears to be a very variable plant, and the Gough Island variety has the leaves broadly ovate, and not linear like the specimens from Tristan da Cunha of Carmichael and Moseley.

Distribution. Tristan da Cunha and Inaccessible Island, and very generally in extra-tropical regions of the Southern Hemisphere.

NERTERA DEPRESSA, *Gaertn. Fruct.* i. p. 124, t. 26; *Hook. f. Handb. Fl. N. Zeal.* p. 120; *Hemsl. Chall. Bot.* i. II. p. 150.
Erythrodanum alsineforme, *Thou. Esq. Fl. Trist.* p. 42, t. 10 (Nertera).

Common in the drier and more barren places.

Distribution. Tristan da Cunha and Inaccessible Island, and southern temperate regions except South Africa.

NERTERA DEPRESSA, *Gaertn.*, var. OBTUSA, *Rud. Br.*

A variety distinct from the normal *Nertera depressa* in having all its leaves obovate with no suggestion of acuteness.

Among the specimens of *Nertera depressa* gathered on Gough Island only one plant of this variety was found. In the Kew Herbarium there is one specimen from Inaccessible Island (*Moseley*, Inaccessible Island, 16.8.73) of this variety. The other specimens of this plant from Tristan da Cunha belong to the typical *Nertera depressa*, and the variety does not appear to occur elsewhere.

Distribution. Inaccessible Island.

GNAPHALIUM PYRAMIDALE, *Thou. Esq. Fl. Trist.* p. 40; *DC. Prodr.* vi. p. 234; *Hemsl. Chall. Bot.* i. II. p. 151, t. 26.
G. Thouarsii, *Spreng. Syst. Veg.* iii. p. 473.

Common up the glen.

Distribution. Tristan da Cunha and Inaccessible Island.

COTULA GOUGHENSIS, *Rud. Br.*, sp. nov. (Plate **9**.)

Herba annua erecta vel suberecta, 25 cm. in altitudine, inferne multe ramosa; folia sessilia fere amplexicaulia, bipinnatisecta, segmentis lanceolatis in apicem acutum rotundatis; capitula folia non superantia, 8 mm. lata; involucri bractea late ovata vel fere rotundata, marginibus integris; flores dimorphi exteriores ♀ uniserrati sine corollis, interiores cum corollis; achenia compressa glabra.

This species is quite distinct in its much blunter leaves and broad involucral bracts from the Nightingale Island species, *Cotula Moseleyi*. It is near *Cotula coronifolia*, but differs in having broad bracts and a smaller inflorescence. *Cotula coronifolia* is also in general a much coarser plant. The only species of *Cotula* near this species as regards the broad bracts is *Cotula integrifolia*, but in other respects this is quite distinct.

Endemic in Gough Island, where it is very plentiful.

HYPOCHŒRIS GLABRA, *Linn. Sp. Pl.* 810; *DC. Prodr.* vii. p. 90.

Very probably an introduced plant here, as Mr. Hemsley considers it to be in Tristan da Cunha.

Distribution. Almost cosmopolitan.

SONCHUS OLERACEUS, *Linn. Sp. Pl.* 792.

Common: probably introduced.

Distribution. Tristan da Cunha and Inaccessible Island and generally throughout temperate regions.

RUMEX OBTUSIFOLIUS, *Linn. Sp. Pl.* 335.

Probably introduced. It has not been recorded previously from the Tristan da Cunha group.

Distribution. Very widely spread in northern and southern hemispheres.

RUMEX FRUTESCENS, *Thou. Esq. Fl. Trist.* p. 38; *DC. Prodr.* xiv. p. 72; *Hemsl. Chall. Bot.* i. II. p. 154, t. 30.

Very common at the mouth of the glen down to high-water mark.

Distribution. Tristan da Cunha and Inaccessible Islands.

EMPETRUM NIGRUM, *Linn. Sp. Pl.* 1022; var. RUBRUM, *Hemsl. Chall. Bot.* i. II. p. 154. E. rubrum, *Vahl, in Willd. Sp. Pl.* iv. p. 713; *Hook. f. Fl. Antarct.* ii. p. 345. E. medium, *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 508.

Plentiful in dryer places.

Distribution. Tristan da Cunha, Inaccessible and Nightingale Islands, and in the Falkland Islands and Tierra del Fuego.

Plantago major, *Linn. Sp. Pl.* 112.

Common and doubtlessly introduced.

Distribution. Generally throughout the northern hemisphere and introduced widely elsewhere.

MONOCOTYLEDONES.*

Scirpus Thouarsianus, *Schult. Mant.* ii. (1824) pp. 84 et 538; *Hemsl. Chall. Bot.* i. ii. pp. 156–158, tt. 33 et 34. S. prolifer, *Thou. Esq. Fl. Trist.* p. 36, t. 7. S. squarrosa, *Spreng. Syst. Veg.* iv. (1827) p. 28; *Boeck. in Linnæa*, xxxvi. (1869–70) p. 507. S. Thouarsianus, *Schult.*, var. bicolor, *Hemsl. Chall. Bot.* i. ii. p. 156, t. 34 (8–16). S. prolifero-ramosus, *Boeck. in Flora*, lviii. (1875) p. 261. S. virens, *Boeck. in Flora*, lviii. (1875) p. 260; *Hemsl. Chall. Bot.* i. ii. p. 158, t. 33 (7–12). S. pallescens, *Boeck. ex Hemsl. Chall. Bot.* i. ii. p. 158. S. Thouarsianus, *Schult.*, var. pallescens, *Hemsl. Chall. Bot.* i. ii. p. 158, t. 33 (1–6).

Isolepis prolifera, *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 503. I. squarrosa, *Carmich. l. c.* xii. (1818) p. 503. I. bicolor, *Carmich. l. c.* xii. (1818) p. 503; *Kunth, Enum.* ii. p. 216. I. acugnana, *Schult. Mant.* ii. (1824) p. 532; *Kunth, Enum.* ii. p. 216. I. Thouarsii, *A. Dietr. Syn. Pl.* ii. p. 109; *Kunth, Enum.* ii. p. 216.

Very common.

Distribution. Tristan da Cunha, Inaccessible and Nightingale Islands.

Scirpus sulcatus, *Thou. Esq. Fl. Trist.* p. 36, t. 7; *Hemsl. Chall. Bot.* i. ii. p. 155 (*var.* Moseleyanus *excl.*) t. 31. S. Thouarsii, *Spreng. Syst. Veg.* iv. (1827) p. 27. S. conspersus, *Boeck. in Linnæa*, xxxvi. (1869–70) p. 505 pro p.

Isolepis sulcata, *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 503; *Kunth, Enum.* ii. p. 216. I. Carmichaeli, *Dietr. Syn. Pl.* ii. p. 107.

Not uncommon.

Distribution. Tristan da Cunha group only, unless the New Zealand plant *Scirpus sulcatus* var.? *β. tristigmatosa*, C. B. Clarke, MSS., can be regarded as truly belonging to this species.

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* For the determination of the species of *Scirpus* I am indebted to Mr. C. B. Clarke.

SCIRPUS MOSELEYANUS, *Boeck. in Flora,* 1875, p. 262. S. sulcatus, *Thou.,* var. Moseleyanus, *Hemsl. Chall. Bot.* i. II. p. 155, t. 32 (fig. 6 excl.).

Only one specimen of this was gathered, but fortunately it was in fruit. The ripe fruits were previously unknown.

Distribution. Nightingale and Inaccessible Islands.

SPARTINA ARUNDINACEA, *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 504; *Kunth, Enum.* i. p. 279; *Hemsl. Chall. Bot.* i. II. p. 160, t. 25.

Ponceletia arundinacea, *Thou. Esq. Fl. Trist.* p. 36.

This is one of the predominant plants of the island, apparently growing luxuriantly everywhere up to an elevation of over 1000 feet.

Distribution. Tristan da Cunha, Inaccessible and Nightingale Islands, and St. Paul and Amsterdam Islands.

POA ANNUA, *Linn. Sp. Pl.* p. 68.

A few plants of this were found near the ruined huts of some sealers. It is no doubt introduced as it is on Tristan da Cunha.

Distribution. Very widely spread.

CRYPTOGAMÆ—FILICES.

ADIANTUM ÆTHIOPICUM, *Linn. Sp. Pl.* ed. II. p. 1560; *Thou. Esq. Fl. Trist.* p. 34; *Hook. & Baker, Syn. Fil.* p. 123; *Hemsl. Chall. Bot.* i. II. p. 163. A. thalictroides, *Willd. ex Kunze, in Linnæa,* x. (1836) p. 530. A. crenatum, *Poir. in Lam. Encyc. Suppl.* i. p. 137. A. Poiretii, *Wikstr. in Kon. Vet.-Akad. Handl. Stock.* (1825) p. 443.

Very plentiful in the glen.

This is a very variable plant, and the Gough Island plant shows several varieties. Until a satisfactory monograph of the genus appears, it seems preferable to include all the Gough Island specimens under the name of *Adiantum æthiopicum.*

Distribution. Tristan da Cunha and Inaccessible Island; Central and South America (except the extreme south), South Africa, India, and New Zealand.

PTERIS INCISA, *Thunb. Prodr. Fl. Cap.* p. 133; *Hook. & Baker, Syn. Fil.* p. 172; *Hemsl. Chall. Bot.* i. II. p. 163. P. vespertilionis δ. Carmichaeliana, *Agardh, Rec. Sp. Gen. Pter.*

p. 80. P. vespertilionis β, *R. Br. ex Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 513.

Growing in dryer places than the preceding plant; not very common.

The Tristan da Cunha specimens of this widely-spread species differ from others in the fact that the veins of the fronds do not anastomose at all (*vide* Hook. & Baker, Syn. Fil. p. 172). The Gough Island plants belong to the same variety.

Distribution. Tristan da Cunha, Nightingale and Inaccessible Islands. Also tropical and temperate South America, South Africa to West Tropical Africa, from the Himalayas to New Zealand and Polynesia.

LOMARIA ALPINA, *Spreng. Syst. Veg.* iv. p. 62; *Hook. f. Fl. Antarct.* ii. p. 393, t. 150; *Hook. & Baker, Syn. Fil.* p. 178; *Hemsl. Chall. Bot.* i. II. p. 164. L. antarctica, *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 513.
Acrostichum polytrichoides, *Thou. Esq. Fl. Trist.* p. 32, t. 2 (A. polypodoides).
Polypodium Pennamarina, *Poir. in Lam. Encyc.* v. p. 520.

Not uncommon in the glen.

Distribution. Tristan da Cunha and South America, including the Falkland Islands and Staten Island, Australia, New Zealand, Marion Island, Kerguelen, the Crozets, St. Paul and Amsterdam Islands.

LOMARIA BORYANA, *Willd. Sp. Pl.* v. p. 292; *Hook. & Baker, Syn. Fil.* p. 180; *Hemsl. Chall. Bot.* i. II. p. 163. L. magellanica, *Desv. in Mag. Nat. Berl.* (1811) p. 330; *Hook. f. Fl. Antarct.* ii. p. 393. L. palmæformis, *Desv. in Mém. Soc. Linn. Par.* vi. (1827) p. 290. L. robusta, *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 512.
Pteris palmæformis, *Thou. Esq. Fl. Trist.* p. 30.

Many specimens of this fern were found growing in marshy ground in the sheltered glen.

It reaches a height of from 2 to 3 feet, but the stems almost always grow in a procumbent position. In diameter the trunk varies from 2 inches to as much as 5 or 6.

The Gough Island plant belongs to the same variety as the Tristan da Cunha one, which Carmichael described as a new species (*Lomaria robusta*, Carmich.). It, however, only differs in having the usually naked rachis more or less densely scaly throughout, and is hardly entitled to specific rank. It must be very plentiful further inland, as the beach is thickly strewn with waterworn stems evidently carried down by the stream from the interior and washed up again by the sea.

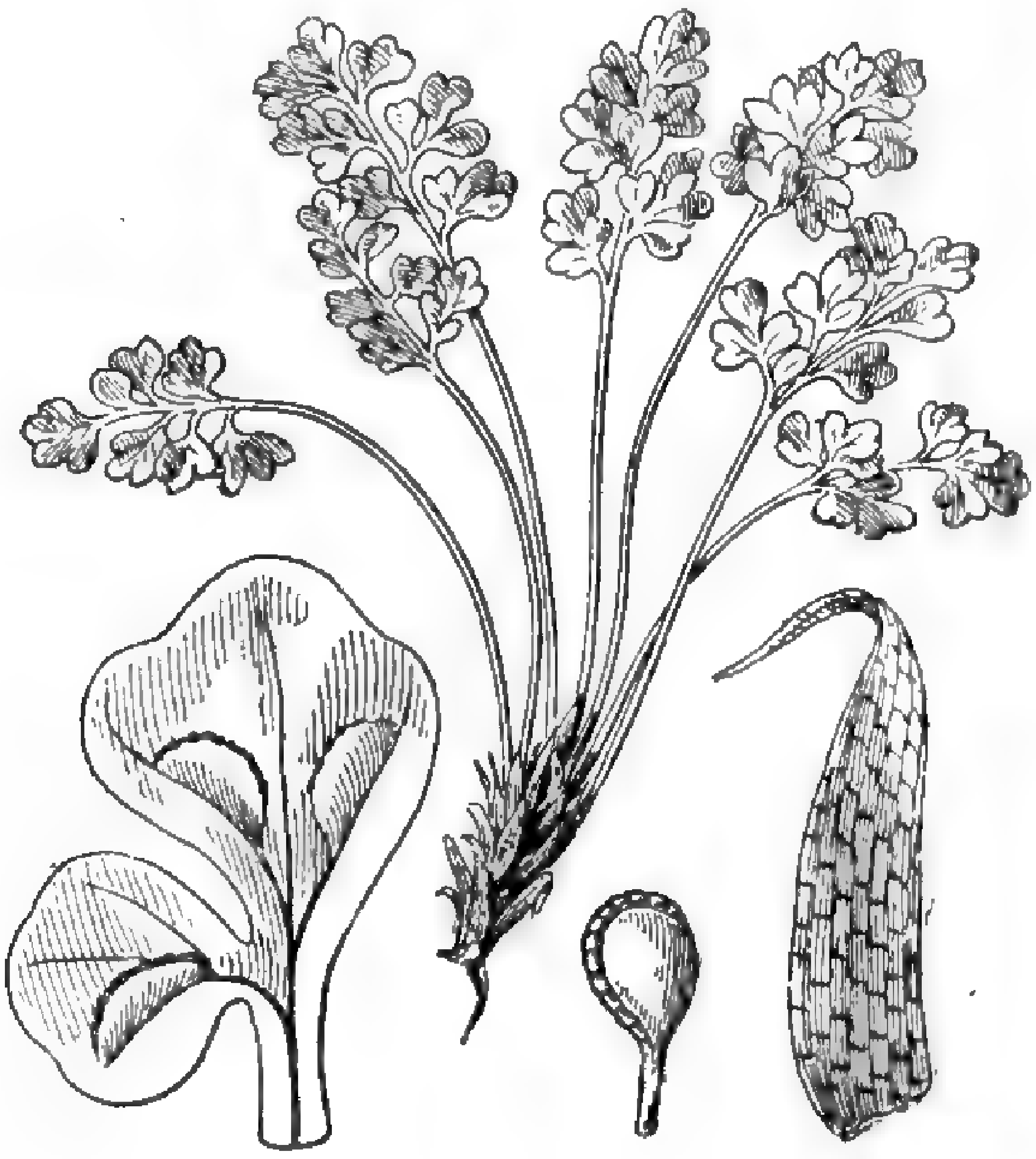
Distribution. Tristan da Cunha; Tropical America to Tierra del Fuego and the Falkland Islands, South Africa, Mauritius, Reunion, and Madagascar.

Asplenium obtusatum, *Forst. f. Prod.* p. 80; *Hook. & Baker, Syn. Fil.* p. 207. A. obliquum, *Forst. f. l. c.*; *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 512. A. crassum, *Thou. Esq. Fl. Trist.* p. 33.

Common in the glen.

This species varies a great deal, and the Gough Island plants, while agreeing with some of Moseley's plants from the Tristan da Cunha Islands, are considerably smaller than Carmichael's specimens from the same place.

Distribution. Tristan da Cunha, Inaccessible and Nightingale Islands. Widely distributed elsewhere.



Asplenium alvarezense, nat. size; with pinnule, sporangium, and scale from caudex, enlarged.

Asplenium alvarezense, *Rud. Br.*, sp. nov. (See woodcut.)

Herba parva; caudex brevis, paleis paucis sparsis; stipites

1 ad 5 cm., tenues virides nudi; frondes oblongo-deltoides bipinnatæ subcoriaceæ; pinnæ superiores sæpe in pinnulas indistincte divisæ; pinnulæ cuneatæ vel late obovatæ, margine exteriore rotundato; pinnularum venæ dichotomæ; sori mediani lineares.

This species is very near to *Asplenium Ruta-muraria*, from which it chiefly differs in having its pinnules always entire. Unfortunately none of the specimens show the sori in very good condition.

Endemic in Gough Island. It is plentiful on the stems of tree-fern (*Lomaria Boryana*), but not common elsewhere.

POLYPODIUM AQUILINUM, *Thou. Esq. Fl. Trist.* p. 32; *Hook. & Baker, Syn. Fil.* p. 311; P. acunhianum, *Carmich. fide Hemsl. Chall. Bot.* i. II. p. 167.

Nephrodium aquilinum, *Hemsl. Chall. Bot. l. c.* t. 39.

Common.

Distribution. Tristan da Cunha, Nightingale and Inaccessible Islands; Amsterdam Island?

POLYPODIUM AUSTRALE, *Mett. Polypod.* p. 36; *Hook. & Baker, Syn. Fil.* p. 322; *Hemsl. Chall. Bot.* i. II. p. 168.

Grammitis australis, *R. Br. Prodr. Fl. Nov. Holl.* p. 146; *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 510. G. magellanica, *Desv. Journ. Bot.* iii. (1814) p. 275.

Only one specimen of this was found.

Distribution. Tristan da Cunha. Tierra del Fuego, Australia, New Zealand, and Marion Island.

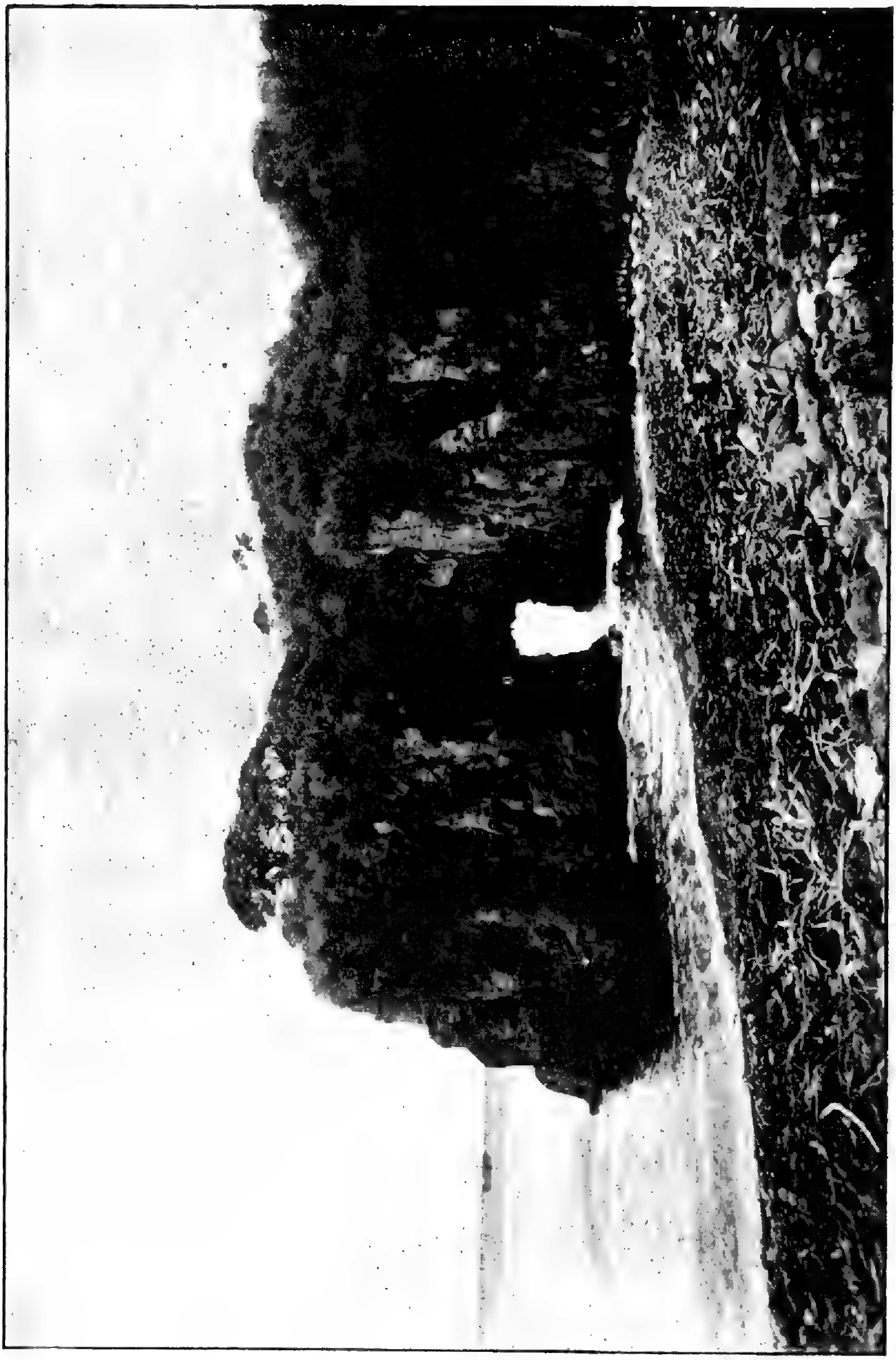
For the determination of this species I am indebted to Mr. C. H. Wright of the Royal Gardens, Kew.

ASPIDIUM CAPENSE, *Willd. Sp. Pl.* v. p. 267; *Hook. & Baker, Syn. Fil.* p. 254. A. coriaceum, *Swartz, Prod. Fl. Ind. Occ.* p. 133; *Hook. Sp. Fil.* iv. p. 32; *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 511; *Hemsl. Chall. Bot.* i. II. p. 167.

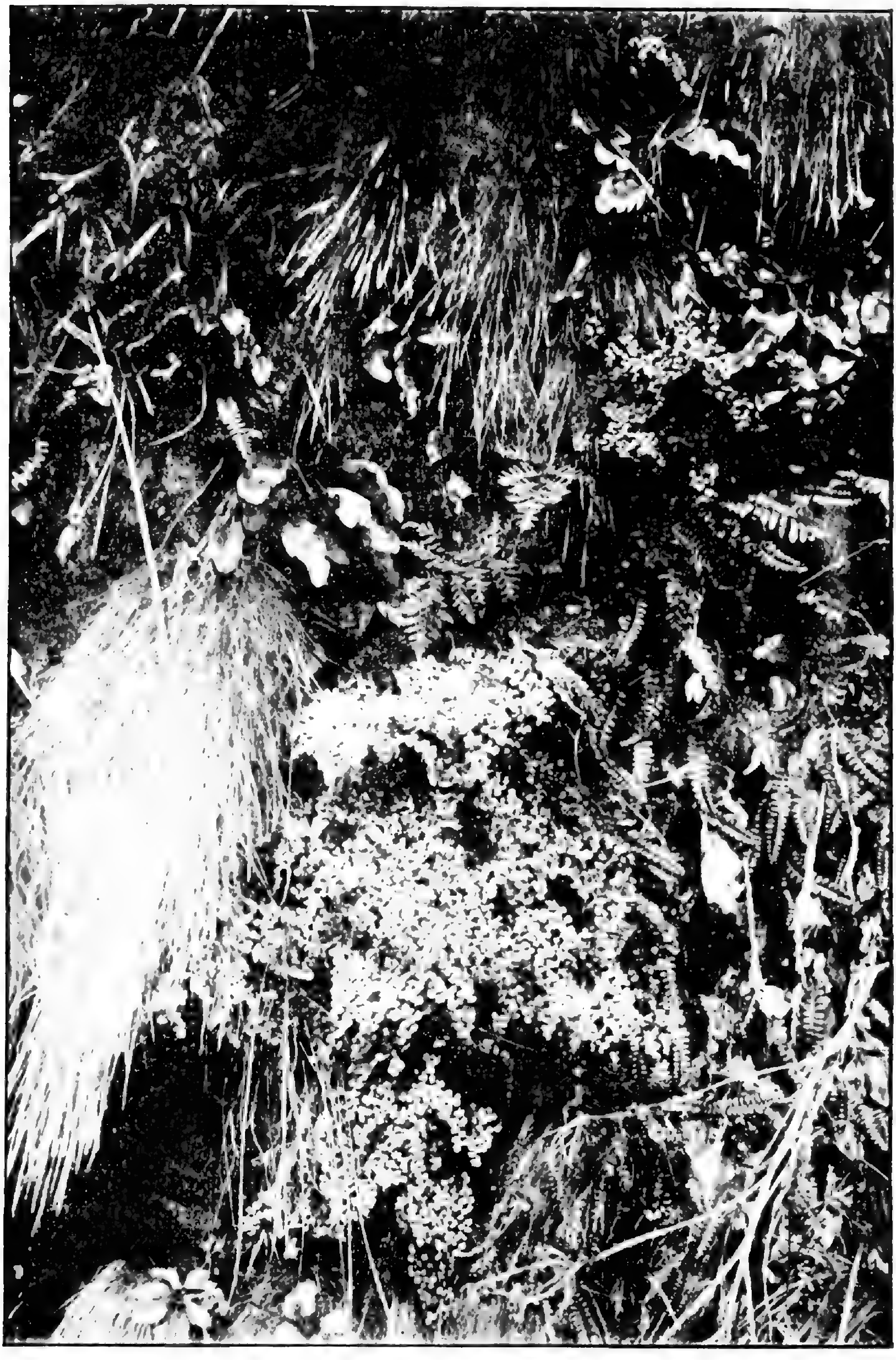
Polypodium calyptratum, *Thou. Esq. Fl. Trist.* p. 33.

Fairly common.

The Gough Island specimens are larger than the Tristan da Cunha ones of Moseley, and in size approximate more to the specimen of De l'Isle's from Amsterdam Island.



GOUGH ISLAND.



VEGETATION ON GOUGH ISLAND.

A. N. Bruce del.
J. N. Fitch lith.
West, Newman imp.

COTULA GOUGHENSIS.

Distribution. Tristan da Cunha. America south of Cuba, South Africa, Mascarene Islands, Amsterdam Island, Australia, and Polynesia.

ACROSTICHUM CONFORME, *Swartz, Syn. Fil.* pp. 10 & 192, t. 1. fig. 1; *Carmich. in Trans. Linn. Soc. Lond.* xii. (1818) p. 509; *Hook. & Baker, Syn. Fil.* p. 401; *Hemsl. Chall. Bot.* i. II. p. 169. A. laurifolium, *Thou. Esq. Fl. Trist.* p. 31.

Varies a little in the degree of scaliness, but the Gough Island plant is identical with other specimens from Tristan da Cunha.

Distribution. Tristan da Cunha. St. Helena and throughout the southern hemisphere.

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EXPLANATION OF THE PLATES.

PLATE 7.

Phylica nitida and *Spartina arundinacea* on Gough Island. Waterworn stems of *Lomaria Boryana* on the beach.
(From a photograph by W. S. Bruce.)

PLATE 8.

Vegetation on Gough Island, showing *Adiantum æthiopicum, Lomaria alpina, Acrostichum conforme, Polypodium aquilinum,* and *Scirpus* sp.
(From a photograph by W. S. Bruce.)

PLATE 9.

COTULA GOUGHENSIS, R. N. Rudmose Brown.
Plant, natural size.

Fig. 1. Apex of leaf. × 2.
2. Inflorescence. × 3.
3. Inflorescence with bract.
4. Vertical section of inflorescence. × 6.
5. Outer ♀ flower with no corolla. × 10.
6. Disc-flower with corolla. × 10.
7. Stamens of disc-flower. × 12.
8. Disc-flower with corolla and stamens removed. × 10.
9. Enlarged stigma. × 15.

Mansonieæ, a new Tribe of the Natural Order Sterculiaceæ. By Lt.-Col. D. PRAIN, I.M.S., F.R.S., F.L.S.

[Read 6th April, 1905.]

(PLATE 10.)

MR. F. B. MANSON, of the Indian Forest Department, has of late assisted the Botanical Survey of India by the communication of material from the rich forests of Tenasserim. Among specimens sent by him to the Calcutta Herbarium are examples of a species that is of interest, in a variety of ways, alike to forestry and to botany.

The immediate occasion of the communication of these specimens has been an enquiry into the source of Kalamet, which has long been known as a scented wood held in considerable estimation by the Burmese. Except that it appears to be employed as a cosmetic by Burmese ladies, the uses to which Kalamet is put are not fully known; even as regards its use as a cosmetic details are wanting as to its preparation. There is, however, a considerable demand for the wood and its retail value varies, in Rangoon, from 12 annas to 3 rupees (=one to four shillings) per viss (= 3·0857 lbs.), apparently according to the abundance or scarcity of supplies. It is exported from Mergui pretty regularly, and the following table, furnished by Mr. Manson, exhibits the quantity and value of the exports from 1887-8 to 1902-3.

Year.	Viss.	Value.	Rate per viss.	
		rupees.	annas.	pies.
1887–88 ……	3,800	290	1	3
1888–89 ……	14,415	2733	3	0
1889–90 ……	13,550	4552	5	5
1890–91 ……	9,480	3775	6	2
1891–92 ……	9,362	2104	3	7
1892–93 ……	5,856	933	2	7
1893–94 ……	12,501	3979	5	1
1894–95 ……	7,251	1670	3	8
1895–96 ……	15,505	5838	6	0
1896–97 ……	16,844	7130	6	9
1897–98 ……	8,728	4225	7	9
1898–99 ……	9,794	3161	5	2
1899–1900 …	9,105	2152	3	9
1900–01 ……	1,697	1137	10	9
1901–02 ……	3,625	1470	6	6
1902–03 ……	5,212	1695	5	2
Average … 1887–1903…	9,170	2928	5	2

Taking the viss at 3·0857 lbs. we have:

	lbs.	Value.	Rate per lb.
Average … 1887–1903…	28,296	£195 2*s.*	5⅛ pence.

At one time it was supposed that the source of Kalamet might prove to be an undescribed species of *Santalum*. In 1878, when the first edition of the 'Manual of Indian Timbers' was prepared, a specimen was received from Tavoy and the wood was examined by Sir D. Brandis, Mr. J. S. Gamble, and Mr. A. Smythies, who considered that it resembled Sandalwood, but that it differed from ordinary Indian Sandal (*Santalum album*, Linn.) in having more prominent medullary rays. When a second edition of the 'Manual' was being prepared, Mr. Gamble wrote to Mr. Manson, Conservator of Forests in Tenasserim, for better specimens. In response to this request Mr. Manson, in 1900, forwarded a piece of Kalamet wood, procured from the headwaters of the Theingôn Choung, near the Siamese frontier of the Mergui district. Mr. Gamble has noted that, as compared with true Sandal, this Kalamet wood is darker in colour; has larger pores somewhat concentrically arranged; broader, more prominent and fewer medullary rays; more marked annual rings; and a different scent, resembling if anything that of the Bog-Myrtle (*Myrica Gale*, Linn.) of Europe *. Mr. Gamble urged his correspondent to procure botanical specimens in order to enable the name of the tree to be determined.

Meanwhile the subject was taken up by Sir D. Brandis in a letter † in which he described his own experience of Kalamet; explained how it had, quite erroneously, been confused with Toungkalamet (*Cordia fragrantissima*, Kurz), a wood of different structure and with a different scent; and stated that he had recently received a small piece of wood from a Burmese friend, and had previously obtained specimens from Mr. J. W. Oliver, when that officer was Conservator of Forests in Upper Burma. Sir Dietrich was also anxious to clear up the identity of the tree, and asked Burmese forest officers to procure him botanical specimens.

In 1903, Mr. Manson at length succeeded in obtaining a supply of specimens of Kalamet and despatched examples to Sir D. Brandis, to Mr. Gamble, and to the Calcutta Herbarium. The specimens sent to Calcutta, which were in fruit only, were examined by Captain Gage, Curator of the Herbarium, who suggested the possibility, having regard to the structure of the fruit, that the species to which they belonged, which was obviously an undescribed one, might be referable to the Sterculiaceous genus *Tarrietia*. In communicating this opinion to Mr. Manson, the writer explained that in the absence of flowers an absolutely certain identification was impossible, and suggested that an attempt should be made to procure the material necessary to clear up the doubt.

This request, as Mr. Manson has explained in letters to Sir D. Brandis and Mr. Gamble, was one with which it was not easy to comply. The Kalamet forests are on the hills on the Siamese frontier more than a hundred miles above the old town of Tenasserim, and for the last forty miles of the journey there are no villages. Moreover, after several attempts to obtain specimens had failed, there seemed reason to believe that the flowering period of Kalamet is between the middle of March and the middle of April, precisely when, owing to the river being low, the journey is most difficult and tedious.

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* Manual of Indian Timbers, ed. 2, p. 588.

† Indian Forester, xxvii. p. 516 (October 1901).

The specimens of wood received by Mr. Gamble were actually obtained by Mr. Manson's assistant, Mr. W. A. Hearsey, Divisional Forest Officer of Tavoy, whose report [*] is as follows :—"The Kalamet tree is found growing on small ridges and spurs running chiefly east and west from the main range of hills called Mawdoung, running north and south. It is found in evergreen forests associated with *Laurineæ*, *Murraya*, *Premna*, and some shrubs belonging to *Oleaceæ*, unfortunately all without flower or seed at this time of year. I measured a tree 5 ft. 6 in. in girth, but one of the guides tells me that they attain a girth of 7 ft. No green trees are ever cut down by Kalamet collectors, as the wood in a green state has a pungent and disagreeable odour and only smells fragrant after it has been lying in the forest for years. Notwithstanding the large quantities extracted annually, the supply of dead wood from windfalls is inexhaustible in these forests. I have brought specimens of dry and green wood, as well as leaves, there being no fruit or flowers at this time of the year. Another reason is that the people are afraid to cut the tree on account of *Nats* [†], and I had some trouble to get the Siamese to cut them down."

A second visit to the Kalamet forests in December 1901 only yielded leaf-specimens, and it was not till August 1902 that the fruiting specimens sent to Calcutta in July 1903 were collected by Mr. Hearsey. In writing at this time to Sir D. Brandis and to Mr. Gamble, Mr. Manson said :—"I conjecture that there are at least two species of Kalamet, one with a dark-brown wood and the other of a pale golden brown, both deliciously scented. A specimen of the latter was received by me from Tavoy in September 1899. It was obtained by Mr. W. A. Hearsey from a lot which was sold in Rangoon for R 2/4 per viss (about 12 annas [one shilling] per lb.). Shortly afterwards, owing to the arrival of a large shipment from Delhi in the Straits Settlements [‡], the price went down to 12 annas per viss (about four annas [fourpence] per lb.). A piece of this was forwarded by me to Mr. Gamble in August 1900, and is one of the specimens B 4920, 4921 (probably the latter) mentioned by him on p. 588 of the second edition of the 'Manual of Indian Timbers.' A few days later I sent him a sample of the dark brown kind, bought in Rangoon at R 3 per viss (about R 1 [one shilling and fourpence] per lb.)."

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[*] Diary of Divisional Forest Officer, S. Tenasserim Division, for week ending 16th March, 1901.

[†] Demons.

[‡] Possibly Deli in Sumatra.

Mr. Manson's surmise has since been confirmed. In November 1904 he sent to the Calcutta Herbarium specimens of "two species of trees, each of which is called by the Burmese Kalamet." One of the two is the species already represented by the leaf-specimens of March 1901 and the fruiting specimens of August 1902. The other is a tree with larger and differently shaped leaves, hitherto unrepresented in the Calcutta Herbarium, as to which, in the absence of flowers and fruit, all that can be said is that it differs from the first certainly specifically and possibly generically. In subsequent references the Kalamet from the Mawdoung Range, of which we have known the fruits since 1903 and of which we now know the flowers, will be spoken of as Kalamet A, the second one being referred to as Kalamet B.

The history of this enquiry illustrates the necessity for caution in relying on the incidence of the vernacular names of economic products. Besides avoiding the confusion, pointed out by Sir D. Brandis, which has taken place between Kalamet as a whole and Toungkalamet, it is necessary to distinguish between two Kalamets of Burmese origin, both as economic products and as botanical species. It is further clear that in Burmese marts the name Kalamet may be applied to a product of Malayan origin. We are not yet able to say whether the commercial distinction between "dark brown" and "golden brown" Kalamet corresponds wholly or in part with the botanical difference between Kalamet A and Kalamet B. We do not know the Malay name of the wood from the Straits Settlements which is sold in Burma as Kalamet, nor have we as yet any means of judging whether this Malayan Kalamet is the product of either of the Burmese species. These points can only be settled by local investigation both in Burma and in Malaya.

If, however, we are still unaware of the source of the Malay Kalamet, and are unable to say more of the Burmese Kalamet B than that it is quite different from the other Burmese Kalamet, the recent communication to the Calcutta Herbarium of flowering specimens fortunately enables us to deal finally with Kalamet A. These specimens have been examined at Calcutta by Mr. J. R. Drummond, who has lately been at work in the Herbarium there;

some have also been examined by the writer, with the kind help of Mr. W. B. Hemsley, in this country. Gage's suggestion that the plant is a new Sterculiad is amply confirmed; the flowers, however, show that it is not a *Tarrietia*. Drummond points out that the affinity of the plant is very close with the interesting African genus *Triplochiton*, Schum. non Alef.; so close, indeed, that it is almost a question whether the Tenasserim plant may not be referable to a marked section or subgenus of Schumann's *Triplochiton*. The points of difference between Manson's species and the species of *Triplochiton*, which are given below, are, however, very marked, and appear to warrant the treatment of the former as the type of a distinct genus. This genus is therefore dedicated to Mr. Manson, to whom we are indebted for the specimens that illustrate it, and is defined below as *Mansonia*, J. R. Drumm.

This genus *Mansonia* possesses greater scientific interest than isolated novelties usually do. Its near ally, *Triplochiton*, Schum., was referred by the lamented Professor Schumann to the cohort *Malvales*; it differs, however, so markedly from all the other genera, except the proposed genus *Mansonia*, of that cohort, that Schumann was unable to place it in any recognised natural order. He therefore proposed * the recognition of a new natural order *Triplochitonaceæ* for its accommodation; this order has more recently been admitted by Mr. C. H. Wright, when describing an additional species of *Triplochiton* †. The writer does not find it necessary to adopt this extreme view. The two genera, *Triplochiton*, Schum., and *Mansonia*, J. R. Drumm., taken together, certainly constitute a distinct and natural group. But the characters which separate this group from all other known groups within the cohort *Malvales*, even those that are most distinctive, so clearly indicate Sterculiaceous affinities that it may easily be referred to *Sterculiaceæ*; within that order, however, it forms a distinct and hitherto unrecognized tribe, *Mansonieæ*.

The question whether the differences exhibited by Manson's tree, when compared with the known species of *Triplochiton*, are sufficiently marked to entitle it to separate generic recognition may be best settled by their enumeration. The leaves of *Triplochiton* are lobed, of *Mansonia* are undivided; bracteoles are described in Schumann's original species of *Triplochiton*, *Mansonia* has none; the calyx in *Triplochiton* is regularly 5-lobed, in *Mansonia* is spathaceous; the petals in *Triplochiton* are distinctly clawed, in *Mansonia* are not; the stamens of *Triplochiton* are a multiple of ten, and are inserted on a distinct ring at the top of the gynandrophore, those of *Mansonia* are ten only, arranged in pairs, with each pair so inserted that though, in the writer's opinion, they should be deemed uniseriate, it is not impossible to believe that they are biseriate, while a distinct apical ring is not developed; the carpels of *Triplochiton* are hidden by five wide, free, hypogynous, subscarious, contorted-imbricate staminodia, those of *Mansonia* overtop, by their long slender styles, the five similarly free and hypogynous, but narrowly lanceolate, petaloid, valvate staminodia.

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* Engler, Bot. Jahrb. xxviii. (1900) p. 330.

† Hooker, Icon. Plant. t. 2758.

These differences, though somewhat numerous, are of rather unequal value. The distinction as to leaves may be put aside as, at best, only specific; differences quite as great occur within large natural genera like *Sterculia* or *Hibiscus*. The distinction as to bracteoles does not hold even within the genus *Triplochiton* itself. The variation in number of the stamens and the difference in length of the styles also provide characters that at best are no more than specific. The more important differences are: that met with in the calyx, though the same difference in large natural genera like *Hibiscus* and *Bauhinia* is only sectional; that met with in the petals, though this again, taken by itself, is not more than sectional; that seen in the staminal insertion, which is possibly more apparent than real; and, finally, that seen in the æstivation of the staminodia. Since these staminodia supply the most striking character that is common to the two genera it might, under ordinary circumstances, be held that the differences which exist in this portion of the flower at the same time provide the most important distinction between the one genus and the other. But mere difference in size is not in itself important; and the valvate disposition of the staminodia in *Mansonia* may only be due to the accident that in this genus these organs are so narrow that overlapping in the bud is unnecessary.

On the other hand, it must be borne in mind that if a solitary important difference, such as that met with in the calyx, or that met with in the corolla, may, taken by itself, be fairly considered of sectional value, two such differences, taken together, may not unfairly be esteemed subgeneric. When to differences that may be rated as subgeneric we add a third, affecting yet another whorl of floral organs, we are induced to conclude that the sum of these differences is of generic value.

The leading points of agreement between *Triplochiton* and *Mansonia* are the deciduous calyx, the contorted-imbricate petals, the hypogynous insertion of the free filaments at the apex of a pronounced gynandrophore, the existence of a whorl of hypogynous free staminodes between the filaments and the gynæcium, and the free pluriovulate carpels, some of which subsequently develop into dry one-seeded mericarps samaroidly winged on the back.

In *Triplochiton* the calyx does not split to the base between the lobes before the organ as a whole separates from the torus; it therefore slips down and for a time persists as a loose collar on the pedicel. In *Mansonia* the calyx splits to the base along one side before the organ as a whole separates from the torus; it therefore at length falls quite away. The different appearance that results is thus accidental; in both genera the calyx as a whole ultimately separates from the torus. The scars on the torus which mark the points of insertion of the petals are small and nearly circular in *Triplochiton*, but elongated and oblique in *Mansonia*; this difference, however, is again accidental, and is due to the petals being clawed in the former genus, sessile in the latter; the essential feature is that the petals in both are contorted-imbricate. As regards both calyx and corolla, therefore, the two genera fall naturally within the cohort *Malvales*, without any clear indication as to which natural order of the cohort best accommodates them. The pronounced gynandrophore or column which intervenes between the petals and the stamens makes it, however, advisable to exclude the genera from *Malvaceæ*, in spite of the fact that, at all events in *Mansonia*, the anthers are 1-locular. They are said by Schumann to be so in one species of *Triplochiton* as well, and although in another species of *Triplochiton* they have been found by C. H. Wright* to be very peculiarly 2-locular, the writer cannot find, in a third species of *Triplochiton* from Lagos which he has examined, that the anthers have two cells. But, although the presence of 1-celled anthers in a Malval as a rule indicates that the plant is Malvaceous and not Sterculiaceous or Tiliaceous, the character is subject to too many exceptions to be accepted as a critical test. Not only are 1-celled anthers to be met with in other genera that are obviously either Tiliaceous or Sterculiaceous, in the *Bombaceæ*, which are usually included in *Malvaceæ*, it is possible to find 2-celled as well as 1-celled anthers in the same flower, and it often happens, even when the anthers are all 1-celled, that the filaments are intimately associated in pairs.

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* Hooker, Icon. Plant. t. 2758.

The staminodia which, in *Triplochiton* and *Mansonia*, are situated between the stamens and the carpels point to *Sterculiaceæ* rather than to *Tiliaceæ* as the more nearly related natural family. Their existence in the form of a corolla-like whorl of free phyllomes at the top of the gynandrophore imparts to the flower an appearance so remarkable that Schumann, as already explained, formed the opinion that we have here to deal with what is a distinct natural family. This, however, is a view that, as has been said above, it is not absolutely necessary to accept. In various Sterculiaceous genera, notably in *Sterculia* itself, there is a central column that is essentially in accord with the gynandrophore of *Triplochiton* and *Mansonia*, the only difference is that at the top of the column in *Sterculia* the anthers are sessile, at the top of the gynandrophore in *Triplochiton* and *Mansonia* they are stalked. In *Sterculia* it is true the flowers are 1-sexual, but the importance of this character is diminished by the fact that 1-sexual flowers are a constant feature in Schumann's original species of *Triplochiton* and are casually to be met with in *Mansonia*. Again, in many *Sterculiaceæ*, though not in *Sterculia* itself, the presence of petaloid staminodia is one of the most characteristic features of the flower. The genus *Pentapetes* may in particular be cited * as one in which the staminodia markedly resemble those of *Mansonia*. It is true that in *Pentapetes*, as in most Sterculiaceous genera where the staminodia are petaloid, these organs are united below with each other and with the stamens in a common tube. This, however, is not a universal feature; in the curious genus *Glossostemon* † the stamens are united to staminodia, much resembling those of *Mansonia*, which are free from each other at the base. The conditions in *Glossostemon* are therefore almost exactly intermediate between those that occur in *Mansonia* and in *Pentapetes*. The features in the andrœcium of *Triplochiton* on which

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* Botanical Register, t. 595.

† Hooker, Icon. Plant. t. 2542.

Schumann has chiefly relied in proposing his natural order *Triplochitonaceæ* are therefore only relative ones. When, on examining the gynæcium, we further find an arrangement of parts that is in complete accord with the corresponding arrangement in *Sterculia*, and a structure of fruit that, in spite of an initial difference in the number of ovules, is identical with the corresponding structure in *Tarrietia*, we are induced to believe that in *Triplochiton* and *Mansonia* we have to deal with two genera of *Sterculiaceæ*.

When we consider the position which these two genera should occupy in that order, we find that, having regard to the calyx, *Triplochiton* might be placed in any of the hitherto recognized tribes, while *Mansonia* might be excluded from all. Having regard to the corolla, either genus might be placed in any of the tribes except the *Sterculieæ*, while, having regard to the gynæcium and the fruit, *Sterculieæ* is the only tribe to which they could with propriety be referred. Along with these mutually antagonistic features in other whorls, we find in the andrœcium an arrangement that on the one hand points to the necessity for the inclusion of both genera in *Sterculiaceæ*, while on the other it excludes both from every hitherto recognized tribe. We are therefore left with no alternative but the recognition of a new tribe to accommodate them.

A question arises as to the name which this tribe should bear. As it is identical with Schumann's natural order *Triplochitonaceæ*, the proposed tribe should under ordinary circumstances be known as the *Triplochitoneæ*. But there is an objection to this name because there is an objection to Schumann's name *Triplochiton*. There is another and an older *Triplochiton*, proposed by Alefeld in 1863 for species that are at present relegated to the somewhat unwieldy genus *Hibiscus*. So long as this view holds the field, Schumann's *Triplochiton* may stand, but if Alefeld's *Triplochiton* should ever be resuscitated, Schumann's *Triplochiton* must automatically disappear. The use of the name *Triplochitoneæ* for a tribe which may at any time be deprived of its *Triplochiton* is at least awkward, and to guard against the contingency it seems desirable to employ the name *Mansonieæ*. The use of this name has another advantage; incidentally it emphasizes the view that in the group under discussion we have to deal with an entity that is probably not entitled to the taxonomic status postulated by Schumann for his order *Triplochitonaceæ*.

Mansonieæ (*Sterculiacearum* trib. nov.). Flores hermaphroditi vel nonnunquam 1-sexuales. Calyx deciduus. Petala 5, decidua. Stamina ad apicem gynophori libera. Staminodia 5, libera, carpellis alternantia. Carpella 5, libera, gynophoro elongato fulta. Fructus samaroideus, indehiscens.

TRIPLOCHITON. Calyx 5-partitus, lobis valvatis. Petala unguiculata. Stamina indefinita. Staminodia subscariosa, contorto-imbricata, carpella stylis brevibus superantia.—*Africa trop.*

MANSONIA. Calyx spathaceus, a latere fissus. Petala sessilia. Stamina 10. Staminodia petaloidea, valvata, quam carpella stylis setæformibus breviora.—*Asia trop.*

Mansonia, *J. R. Drumm.*

Flores hermaphroditi vel nonnulli 1-sexuales masculi. Calyx spathaceus, a latere fissus. Petala 5, carpellis opposita. Stamina 10, filamentis liberis ad apicem gynophori elongati inserta, ibique quasi 2-seriata sed vere per paria insertione paullum obliqua cum petalis carpellisque alternantia staminodiisque subjecta; antheræ 1-loculares. Staminodia 5, petaloidea, valvata, hypogyna, cum paribus filamentorum singulis consociata, inter stamina et carpella inserta et utrisque alternantia. Carpella 5, libera, in stylos totidem setæformes abeuntia, hisque staminodia superantia. Ovula 5–9, minuta, anatropa, ad suturam carpelli interiorem affixa. Fructus siccus, carpellorum indehiscentium liberorum sæpius 1–2 tantum maturantium, basi ovoideo inflatorum, dorso in alam falcatam productorum compositus. Semen in carpellis singulis maturis unum.—Arbor, foliis indivisis. Inflorescentia cymosa, cymis paniculam spurie terminalem formantibus.

Species 1 (*M. Gagei*, J. R. Drumm. MSS.) in silvis Birmanniæ australis incola.

MANSONIA GAGEI, *J. R. Drumm.*

Arbor, caudice circumambitu ultra metrali, ligno aromatico. *Ramuli* juniores floriferi pallidi, glabri, cortice rugosi. *Folia* sparsa, simplicia, chartacea, margine dimidio anteriore remote et obtuse serrata cæterum integra, ambitu oblongo-ovata vel ovato-lanceolata, apice obtuse acuminata, basi plus minusve cordata ibique 5-nervia, nervis imis gracilibus submarginalibus, sequentibus ramos crassiores nervi petiolum continuantis medii sub-4-jugos oppositos vel summos subalternantes simulantibus; supra intense subtus pallidiore viridia; juniora subtus pubescentia mox tamen glabrescentia, supra prope basin villis longioribus sparse obsita, cæterum glabra; 8–12 cm. longa, 3·5–5 cm. lata: petiolus ·6–1 cm. longus, glaber; stipulæ inconspicuæ, caducæ. *Inflorescentia* cymosa, cymis quasi in paniculam subterminalem aggregatis, nec tamen recte paniculata, ob rachin alabastro tandem in ramum foliosum evolvendo terminata. *Flores* hermaphroditi nonnullis 1-sexualibus masculis adjectis; alabastra ovato-acuta; pedicelli pergraciles 6–8 mm. longi, pilis stellatis sparse obsiti; bracteæ basales inconspicuæ, membranaceæ, caducæ; bracteolæ 0. *Calyx* spathaceus, sub anthesin 8 mm. longus, in latere a bracteâ averso tandem longitudinaliter fissus, mox deciduus, herbaceus, extus pilis stellatis sparse obsitus, nervis gracilibus anastomosantibus, longitudinalibus perpaucis vix tamen sepala distincta manifeste adumbrantibus additis, valde venosus. *Petala* 5, carpellis opposita, sessilia, omnino libera, oblongo-cuneata, obtusa, manifeste venosa, rubescentia, chartacea, nunc sinistrorse nunc in cyma eadem dextrorse contorto-imbricata, 7·5 mm. longa, 2·75 mm. lata, in alveolis tori linearibus obliquis inserta. *Stamina* 10, ad apicem gynophori 2·5 mm. longi, leviter 5-sulcati, præsertim in costis staminodiis oppositis, petalis carpellisque alternantibus sparse puberuli inserta, et, ob insertionem per paria obliqua filamentorum inter se liberorum, quasi 2-seriatim disposita; antheræ 1-loculares. *Staminodia* 5, petaloidea, hypogyna, valvata, lanceolata, acuta, 3·5 mm. longa, 1·5 mm. lata, inter stamina et carpella inserta, hisque petalisque alternantia. *Carpella* 5, petalis opposita, inter se libera, extus dense pubescentia, corpore 3·5 mm. longa, in stylos glabros distinctos setæformes subrecurvos 1·5 mm. longos abeuntia; ovula 5–9, minuta, anatropa, ad suturam carpelli interiorem affixa. *Fructus* siccus; carpellis maturitate 3–5 cm. longis, nunc singulis, sæpius binis, rarissime ternis, indehiscentibus, dorso in alam chartaceam falcatam 2·25 cm. longam, 1 cm. latam productis, cæterum in loculum basalem coriaceum ellipticum, 1-spermum, 8 mm. longum, 7 mm. latum, 3·5 mm. crassum inflatis. *Semen*, vix tamen maturum, nigrescens, nitidum.

Burma: Tenasserim, in montibus Mawdoung ad fontes fluminis Theingôn Choung prope confines regionis Mergui Siamenses, *Hearsey et alii*!

The writer is indebted to Mr. J. S. Gamble for kindly supplying the subjoined note on the wood of *Mansonia Gagei.*

Note on the Wood of Mansonia Gagei.

"The wood-specimens before me consist of:—

"A. A block from an old dry log of very hard wood, heartwood only, cut in the Kalamet Forest in March 1901 by Mr. Hearsey.

"B. A round from a green tree giving bark and sapwood as well as heartwood, the round measuring $10\frac{1}{2}$ inches in diameter. The bark is $\frac{1}{8}$ in. thick and the sapwood $1\frac{1}{4}$ inches. Tree from Theingôn Choung, cut in December 1901 by Mr. Hauxwell.

"C. A book-form block, apparently from the same tree as B, but bearing a different date, June 1903.

"D. A small slab, 6 in. × $5\frac{1}{4}$ in. × $\frac{3}{8}$ in., cut from the heartwood of a green tree about 4 ft. in girth in Wot-kyi-tal, Kalamet Forest, in March 1903.

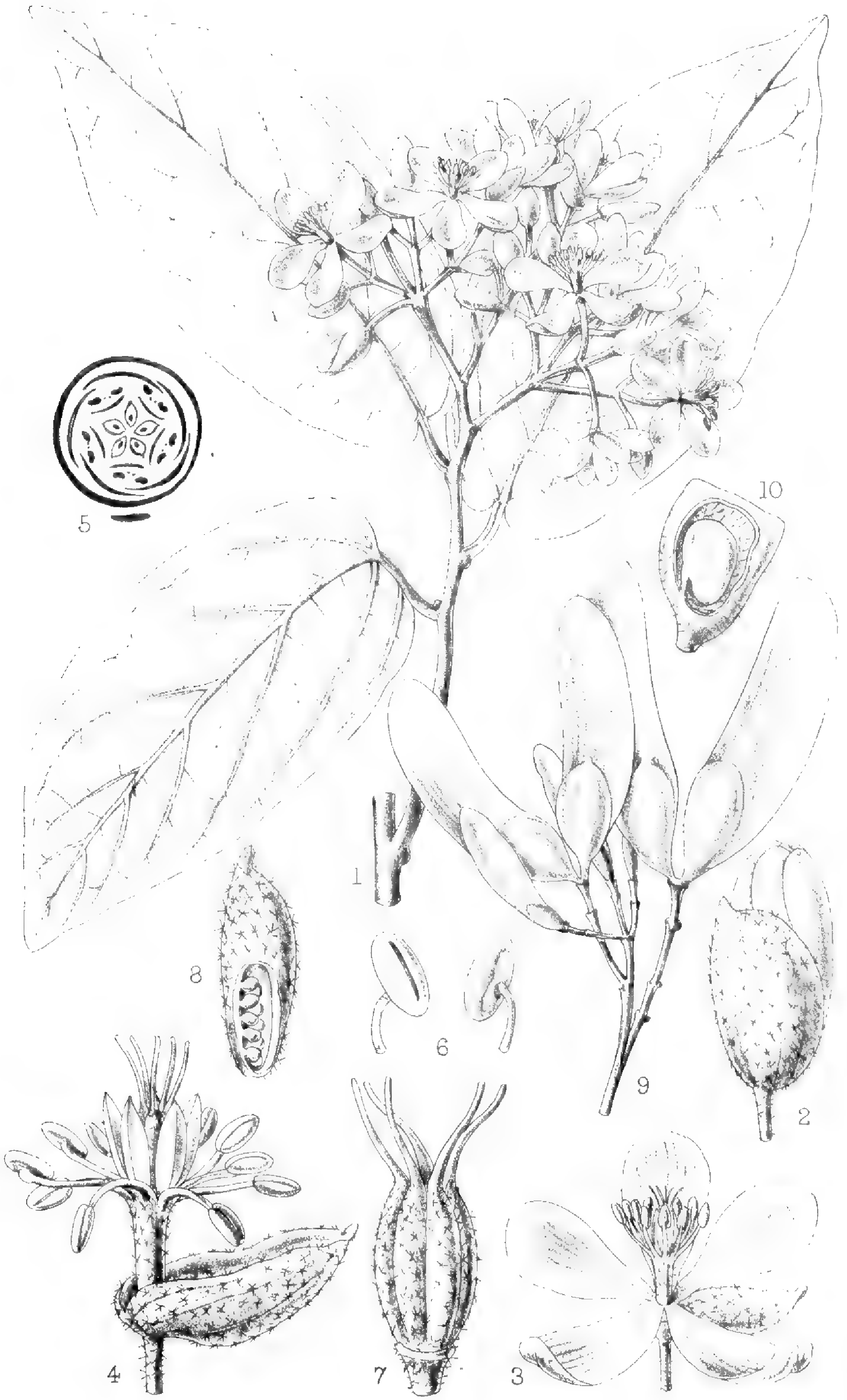
"E. Two small pieces of side-slab, bought in the Rangoon Market.

"They all appear to agree in structure, and that may thus be described:—

"*Bark* $\frac{1}{8}$ in. thick, dark greyish brown, with shallow vertical fissures, the outer part peeling off in thin irregular flakes. *Wood* very hard, heartwood dark olive-brown, sapwood light brown; texture close and homogeneous. *Annual rings* doubtful, but rings are clearly seen though they are difficult to trace: if true annual rings, however, there are about 14 to the inch of radius, a very slow growth. *Pores* small, very numerous, arranged in more or less conspicuous, but often slightly oblique concentric lines, evenly distributed: the pores touching the adjoining medullary rays on either side. *Medullary rays* fine, very numerous, regular, long, about 300 to the inch: a radial section showing a finely-marked silver-grain. *Weight* about 70 lbs. per cubic foot."

Mr. Gamble informs the writer that the wood-specimens will be presented to the Museum at the Royal Botanic Gardens, Kew.

The drawing (Pl. **10**) which accompanies this paper has, with the exception of the floral diagram, been prepared by Miss M. Smith. It will be noted that the imbrication of the petals shown in the diagram reverses the arrangement shown in the fully-opened flower (fig. 3). Both representations are correct, as both arrangements are at times to be met with in the flowers of the same cyme. That given in the diagram appears, however, to be the more usual one.


5
10
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2
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3

M. Smith del.
J. N. Fitch lith.

West, Newman imp.

MANSONIA GAGEI. *J. R. Drumm.*

EXPLANATION OF PLATE 10.

MANSONIA GAGEI, J. R. Drumm.

1. Flowering twig. 2. Flower, not fully opened, showing rupture of spathaceous calyx. 3. Fully-opened flower. 4. Flower, the petals removed, showing staminodia. 5. Floral diagram. 6. Anthers. 7. Carpels. 8. Carpel, laid open, showing ovular attachment. 9. Fruiting cyme. 10. Seed, not yet mature, *in situ*.

Figs. 1 *and* 9 *are of natural size ; figs.* 2–4, 6–8, *and* 10 *are variously enlarged.*

The Botany of Gough Island.—II. Cryptogams (excluding Ferns and Unicellular Algæ) *. By R. N. RUDMOSE BROWN, B.Sc., C. H. WRIGHT, A.L.S., and O. V. DARBISHIRE. (Communicated by Mr. W. BOTTING HEMSLEY, F.R.S., F.L.S.)

[Read 1st June, 1905.]

THIS paper completes the account of the Flora of Gough Island as at present known, with the exception of the unicellular Algæ, which are not yet ready.

The Mosses collected by the Scottish National Antarctic Expedition at Gough Island comprise nine species.

One species is new (*Macromitrium antarcticum*) and three are, unfortunately, too incomplete to admit of more than generic determination. Of the remaining five it is curious to note that, despite the number of mosses known from Tristan da Cunha, only one of the Gough Island mosses has been recorded from there.

The collection includes three Hepatics, all widely spread, and two of them previously known from Tristan da Cunha, while the third has been recorded from St. Helena.

Seven species of Lichens were collected, all of comparatively wide distribution.

One species of Fungus was found which from its distribution may quite possibly have been introduced.

Finally, I wish to record my thanks to Dr. O. V. Darbishire, who has undertaken the Lichens, and to Mr. C. H. Wright, who, through the kindness of the Director of Kew, determined the Mosses and Hepatics.

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* R. N. Rudmose Brown, "The Botany of Gough Island.—I. Phanerogams and Ferns," Journ. Linn. Soc., Bot. xxxvii. (1905) pp. 238–249.

The Mosses of Gough Island.

By C. H. Wright, A.L.S., Royal Botanic Gardens, Kew.

Sphagnum acutifolium, *Ehrh. Crypt. Exs.* n. 72; *C. Muell. Syn. Musci*, i. p. 96; *Schimp. Torfmoose*, p. 56, tt. 13–14.

This has apparently not been recorded from Tristan da Cunha.

Distribution. Cosmopolitan.

Dicranella sp.?

The species is indeterminable; the specimens consist of only male shoots.

Campylopus sp.?

Only a few barren stems.

Rhacomitrium flavescens, *Cardot, in Rev. Bry.* (1900) p. 41, *and in Résult. Voy. 'Belgica,' Mosses*, p. 30.

Distribution. Tierra del Fuego.

Macromitrium antarcticum, *C. H. Wright*, sp. nov.

M. macropelmati, *C. Muell.*, affinis, foliis basi non late vaginantibus differt.

Plantæ repentes, dense cæspitosæ. *Rami* laterales aggregati, erecti, 1 lin. alti. *Folia* oblongo-lanceolata, acuminata, integra, 1 lin. longa, $\frac{1}{6}$ lin. lata, parte superiore e cellulis quadratis omnino facta, basi vix dilatata e cellulis vermicularibus composita. *Folia perichætialia* oblongo-acuta. *Seta* stricta, $2\frac{1}{2}$ lin. longa. *Theca* ovalis, $\frac{1}{2}$ lin. longa, luteo-fusca. *Peristomium* simplex, dentibus oblongis, obtusis.

This species resembles *M. macropelma*, C. Muell., in habit and capsule, but the leaf of that has a broad sheathing base.

Endemic in Gough Island.

Bryum albicans, *Brid. Bry. Univ.* i. p. 656; *C. Müll. Syn. Musc.* i. p. 295; *Mitt. in Chall. Bot.* i. ii. p. 224. B. Wahlenbergii, *Schwaegr. Suppl.* i. ii. p. 92, t. 70. fig. 1; *Bruch & Schimp. Bry. Eur.* t. 354. Webera albicans, *Schimp. Coroll. Bry. Eur.* p. 67.

Distribution. Cosmopolitan, but not recorded from Tristan da Cunha.

Bryum sp.?

Only barren stems; species undeterminable.

Polytrichum commune, *Linn. Sp. Pl.* ed. II. p. 1573; *C. Muell. Syn. Musc.* i. p. 220.

Distribution. Cosmopolitan, but not recorded from Tristan da Cunha.

Rhynchostegium rhaphidorhynchum, *Paris, in Actes Soc. Linn. Bordeaux,* ii. (1897) p. 170.

Hypnum (§ Aptychus) rhaphidorhynchum, *C. Muell. Syn. Musc.* ii. p. 354. H. (§ Rhynchostegium) raphidorrhynchum, *Mitt. in Chall. Bot.* i. II. p. 175.

Distribution. Australia, South Africa, and Tristan da Cunha.

Hepatics.

By C. H. Wright, A.L.S.

Marchantia polymorpha, *Linn. Sp. Pl.* ed. II. p. 1603; *Taylor, in Lond. Journ. Bot.* (1844) p. 480; *Mont. in Voy. Pôle Sud, 'Astrolabe,'* i. p. 212; *Mitt. in Chall. Bot.* i. II. p. 178; *Steph. Sp. Hepat.* i. p. 164.

Distribution. Cosmopolitan, except that it has not been recorded from the African continent. Tristan da Cunha.

Jamesoniella colorata, *Spruce, in Journ. Bot.* xiv. (1876) p. 202.

Jungermannia colorata, *Lehm. in Linnæa,* iv. (1829) p. 366; *Gottsche, Lindenb. & Nees, Syn. Hepat.* p. 86; *Mitt. in Chall. Bot.* i. II. p. 176.

Distribution. Australia, New Zealand, South Africa, Kerguelen, Tristan da Cunha, and Temperate South America; and Clarence Island, South Shetlands.

Lophocolea bidentata, *Dumort. Recueil Obs. Jung.* p. 17; *Gottsche, Lindenb. & Nees, Syn. Hepat.* p. 159.

Jungermannia bidentata, *Linn. Sp. Pl.* ed. II. p. 1598.

Distribution. Cosmopolitan. Recorded from St. Helena, but not from Tristan da Cunha.

Fungi.

Merulius ambiguus, *Berk. North Amer. Fungi,* n. 165; *in Grevillea,* i. (1872) 69. M. fugax, *Rav. Fungi Car.* i. p. 24; *Sacc. Syll.* vi. p. 416.

Grows on the trunks of *Phylica nitida.*

Distribution. North America.

Du Petit-Thouars* mentions four fungi from Tristan da Cunha, among which is a species of *Merulius* which, from his imperfect description, might quite well be this species. On the other hand, it is quite likely that the American sealers who used to visit Gough Island were responsible for the introduction of this North-American species.—[R. N. R. B.]

The Lichens of Gough Island.

By OTTO V. DARBISHIRE.

The following is an enumeration of the seven species of Lichens brought from Gough Island by the Scottish National Antarctic Expedition, and collected there by Mr. R. N. Rudmose Brown in April 1904. Of the seven species five are already known as being arctic and alpine plants.

CLADONIA SQUAMOSA, *Hoffm. Deutsche Fl.* ii. 152.

Cosmopolitan, but not arctic. This plant was found in small quantities.

PARMELIA CETRATA, *Ach. Syn. Meth. Lich.* 198.

This species was found growing on branches of *Phylica*. It is most commonly met with in more temperate parts of the world, but I do not doubt that the specimens before me, though sterile, do belong to this species.

PARMELIA SPHÆROSPORELLA, *Muell. Arg. in Flora*, lxxiv. (1891) 378.

This specimen is small and incomplete, but both in internal structure and external appearance it corresponds to the original specimen and description of J. Müller Argoviensis. He records its occurrence in the hills of Oregon.

USNEA BARBATA, *Fries, Sched. Crit. Lich. Suec.* 34.

A number of good healthy specimens, all sterile, were brought back from Gough Island. No attempt has been made to separate out the varieties of this species. It is found in every part of the world, being common also as an arctic plant.

RAMALINA SCOPULORUM, *Ach. Lich. Univ.* 604.

Arctic, in Europe, Asia, and America. Gathered from rocks, and in full fruit.

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* Du Petit-Thouars, "Description abrégée des Isles de Tristan d'Acugna et Esquisse de la Flore, etc.," Mélanges de Botanique et de Voyages (1811), p. 25.

Physcia stellaris, *Nyl. Syn.* 424.

Another cosmopolitan plant, but not typically alpine. A small specimen found growing with *Parmelia cetrata* on stems of *Phylica.*

Stictina fuliginosa, *Nyl. Syn.* 347.

Fairly common in all continents except Asia. Only a small specimen of this plant was collected on Gough Island, and it belongs, I think, to this species.

The collection also contains some fragments of a *Parmelia* plant, one of which might be *Parmelia saxatilis*, Ach., but they are too imperfect to admit of precise identification.

Notes on the Genus *Widdringtonia*. By Maxwell T. Masters, M.D., F.R.S., F.L.S., Correspondent of the Institute of France.

[Read 15th June, 1905.]

See P. 334

For reasons assigned in a communication made to the Society in December 1892 *, it was deemed expedient to treat the genus *Widdringtonia* of Endlicher as distinct from the North-African *Tetraclinis* and the Australian genera *Callitris* and *Actinostrobus*, although the resemblances between them are so great that there can be no hesitation in believing them to have had a common origin.

Reference may be made to the communication already alluded to for a statement as to the differential characteristics between the genera above named. It may, however, be here mentioned that one of the African species to be hereafter enumerated has six scales to the cone, and in so far breaks down the character employed as differentiating *Widdringtonia*, which usually has four scales, from *Callitris*, which has six. This exceptional case, however, is not sufficient to invalidate the general rule. The synonymy of the genus may be thus expressed :—

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* Journ. Linn. Soc., Bot. vol. xxx. (1895) pp. 11, 15, 16.

WIDDRINGTONIA.

Endlicher, Cat. Hort. Vindob. i. p. 209 (1842); Synopsis Coniferarum (1847), p. 31; Lindley and Gordon, in Journ. Hort. Soc. Lond. v. (1850) p. 205; Knight and Perry, (Rauch) Synopsis (1850), p. 13; Carrière, Traité Général des Conifères, ed. 1 (1855), ed. 2 (1867); Gordon, Pinetum (1858), p. 332, ed. 2 (1875); Henk. et Hochstetter, Syn. der Nadelholz (1865), p. 292; Harvey, Genera of S. African Plants, ed. 2, Hooker (1868). The foregoing authors have for the most part followed Endlicher without adding much to our knowledge of the genus. Additional information was supplied by the following botanists:—Schlechtendal, in Linnæa, xxxiii. p. 339, tab. 1 (1864); Parlatore, in DC. Prodr. xvi. II. p. 442 (1868); Masters, in Journ. Linn. Soc., Bot. xxx. p. 16 (1895).

Thuiæ sp., Linn. Mant. p. 125.

Cupressi spp., Thunberg, Fl. Cap. p. 500.

Juniperi spp., La Marck, Encyc. i. (1786).

Schubertia, Sprengel, Syst. Veg. iii. p. 890 (1826).

Pachylepis, Brongniart, in Ann. Sc. Nat. sér. I. (1833) xxx. p. 189, non Lessing.

Parolinia, Endl. Gen. Supp. i. 1372 (1840).

Callitridis spp., Benth. in Benth. et Hook. Gen. Pl. iii. (1880) p. 424; Eichler, in Engler u. Prantl, Natürl. Pflanzenfamilien, Teil ii. p. 93 (1889).

The genus consists of a small number of xerophytic, monoicous trees, valuable for their timber and for their fragrant resin, which exudes especially from their cone-scales.

They occur in the mountainous districts of the Cape Colony, from west to east in Kaffraria, Natal, in Mozambique and in Central Africa, and it appears probable that additional species will be discovered in the mountainous districts of South and of Central Africa.

The species at present known are:—

1. W. JUNIPEROIDES, *Endlicher, Synops. Conif.* (1847) p. 32; *Schlechtendal, in Linnæa*, xxxiii. p. 339 (1864), tab. 1; *Parlatore, in DC. Prod.* xvi. II. (1868) p. 442, aliorumque.

Under this are included as synonyms:—

Cupressus juniperoides, *Linn. Sp. Pl.* p. 1422.

Cupressus africana, *Miller, Dict.* ed. 8.

Juniperus capensis, *Lamarck*, *Encyc.* ii. 626.

Schubertia capensis, *Spreng. Syst.* iii. p. 890.

Callitris arborea, *Schrader ex Meyer*, *Pflanzengeogr. Docum.* p. 73 et 170.

Pachylepis juniperoides, *Brongn. in Ann. Sc. Nat.* sér. 1, vol. xxx. (1831) p. 190, besides other unauthorised names which have not been taken up by botanists.

This species occurs in the Cedarberg Mts., whence specimens are found in herbaria from *Ecklon & Zeyher*, 74 (teste *Parlatore*); Swellendam, *Drège*!; *Wallich*! *Hutchins*! (see Agric. Journ. Cape of Good Hope, May 1905); Clanwilliam, *MacOwan*, 1649!

The cones are relatively large. The scales are coarsely tubercled with everted edges, which thus render the dorsum concave.

The seeds are about 1 cent. long, oblong, thick, somewhat 4-sided, with a truncate, membranous wing and a large, 3–4-sided whitish hilum.

2. WIDDRINGTONIA SCHWARZII.

Arbor pyramidalis, 50–80-ped. alt., ramosissima, ramis ascendentibus, cortice griseo obtectis, ramulis densis ascendentibus curvatis subtetragonis ultimis divaricatim patentibus fronde appressa omnino condensatis; folia circa 3 mill. long., 1 mill. et ultra lat., squamiformes ultra medium adnato-decurrentia crassiuscula oblonga acuta dorso convexiuscula, medio glandula notata. Inflorescentia mascula haud visa; strobili feminei numerosi ad apices ramorum capitatim aggregati breviter pedunculati, singuli circa 23–25 mill. diam.; squamæ 4, 20–22 mill. long., 12–15 mill. lat., lignosæ crassæ oblongæ, aliæ apice truncatæ, aliæ paulo majores acutiusculæ, omnes triquetræ dorso concavæ glanduloso-tuberculatæ sub apice uncinato-mucronatæ, intus bifaciales carinatæ, læviusculæ, basi maculis 2–3 albidis hilæformibus notatæ columellamque transverse oblongam cingentes; semina 8–12 ascendentia, 10 mill. long., oblonga compressa basi triquetra, nigrofuscescentes, alâ pallidiore retusa superata.

Willowmore, Konga Mts., Bavians Kloof, alt. 800–1200 met., *Schwarz*! *Marloth*, 3614.

Callitris Schwarzii, *Marloth, in Engler, Jahrb.* vol. xxxv. (1905) p. 206.

A species having much of the appearance of *W. juniperoides*, but differing in smaller, thicker, and less acutely pointed leaves, in the smaller cones (20-22 mill. across when expanded); the cone-scales are also less tubercled and narrower, about 26 mill. long, 10–12 mill. broad.

3. WIDDRINGTONIA CUPRESSOIDES, *Endlicher, l. c.*; *Parlatore, l. c.*

Thuya cupressoides, *Linn. Mant.* p. 125; *Thunberg, Fl. Cap.* p. 500.

Callitris cupressoides, *Schrader ex E. Meyer, Pflanzengeogr. Docum.*; *Durand et Schinz, Conspectus*, v. p. 950.

Pachylepis cupressoides, *Brongn. in Ann. Sc. Nat.* sér. I. vol. xxx. (1831) p. 189.

Caput Bonae Spei, *Masson*!; *Ecklon*, 56 *b*! *Drège*, 3885 *b*!; *Schott*, 828 ex *Parlatore*; *Wawra*, 149 ex *Parlatore*; Grahamstown, *Dr. Thom*, 103 and 163 in herb. Kew.!; S. Africa, *Drège*! *Burchell*, 771! 4688! 5588; *Harvey*, 419!; Tafelberg Plateau, *Wilms*, 3036!; *Kiggelaer*!; Drakensberg, *Sanderson*, 2011! The seeds are 7–8 mill. long, obovate compressed, with a membranous retuse wing.

This species is readily recognized by its cone-scales, which are convex and relatively smooth. There is a specimen from the "Hortus Cliffortianus" in the Natural History Museum labelled *Thuja javanica*, which is in all probability referable to this species.

4. W. WHYTEI, *Rendle, in Trans. Linn. Soc.* ser. 2, *Bot.* vol. iv. (1894) tab. 9. figs. 6–10; *Kew Bulletin*, 1892, p. 121, absque descript.; *Mast. in Gard. Chron.* June 16, 1894, p. 746, August 18, 1894, p. 18, Jan. 14, 1905, p. 18 (foliorum anatomia); *Nature*, November 22, 1894, p. 85.

Nyassa Land, Mt. Milangi, alt. 10,000 ped., *Whyte*!; Zomba, *Whyte*! *McClounie*!

The cones are 15 mill. long, the scales separating at maturity, oblong or pointed, slightly tubercled. Seeds 1 cent. long, oblong-falcate, with a blackish membranous wing thinly sprinkled with small resiniferous tubercles.

In section the leaves show, on the upper surface, a palisade-like arrangement of the cells and one resin-canal of large calibre outside the endoderm, immediately beneath the single fibro-vascular bundle. The primordial leaves are an inch long, spreading, linear, and glaucous; others of an intermediate character have the same form and appearance but are smaller, whilst the adult leaves are small, deltoid, and closely appressed to the branch.

5. **WIDDRINGTONIA MAHONI**, *Mast.*, sp. n.

Arbor 15-30-ped., ramosissima; folia subtetrasticha vel laxiuscule subspiraliter imbricata appressa squamiformes, sing. 2-3 mill. long., oblonga acuta dorso convexa glandulosa; strobili ad apices ramulorum aggregati, 16 mill. long., expansi ad 20 mill. lat.; squamæ rotundatæ dorso concavæ tuberculatæ, subapice foliaceo-mucronatæ; semina oblongo-obovatæ ad apicem alata, ala retusa.

Rhodesia merid. orientali, Melsetter alt. 4500–7000 ped., *Mahon*!.

Mr. Mahon notes that this species also occurs on the Chimanina range, which forms the eastern boundary between Melsetter and the Portuguese possessions. The timber, according to the same botanist, is firm and odoriferous, resembling that of *W. Whytei*, as do the fruits and seeds, but the foliage is distinct and markedly so in the young state, when the plants are of a dull, dark green without the bluish-green hue so remarkable in young specimens of the Milangi cedar.

6. **W. EQUISETIFORMIS**, *Mast.*, sp. n.

Arbor ramosissima, rami ascendentes, cortice primum rubello demum argentato obtecti, ramuli numerosissimi, dense tenuissimi, fragiles fronde viridi condensati; folia tristicha, circa 2–3 mill. long., oblonga fere ad apicem triangularem adnata plerumque eglandulosa; flores monoici; amenta mascula ad apice ramulorum sita, 3 mill. long., cylindrato-oblonga; strobili feminei breviter pedunculati ad apicem ramulorum aggregati, singuli circa 12 mill. long., 10–11 mill. lat., subglobosi; squamæ 6 an semper?, clausæ, valvatæ oblongæ acutæ, rugulosæ; bractea maxima pro parte cum squama concrescens, apice in mucronem deltoideam subfoliaceam liberam excurrens; semina haud visa.

Kaffraria, Katbergen Div. Stockenstrom, alt. 4000-5000 ped., *Baur*, 1164! Tokai, cult.!; in herb. Mus. Brit. adest specimen sub numero 21, a cl. *Burchell* collectum, huicce speciei forsan referendum.

Other species mentioned in books are:—

W. Commersoni, Endlicher, Parlatore, *l. c.*—Mauritius, but not included in Baker's Flora of that island.

W. natalensis, Endlicher, = W. CUPRESSOIDES.

W. Wallichii, Endlicher, probably = *W. juniperoides*.

CLAVIS ANALYTICA.

1	Folia tristicha vel subspiraliter disposita. Strobili squamæ 4 vel raro 6	2
	Folia tetrasticha. Strobili squamæ 4	3
2	Folia verticillata arcte appressa. Strobili squamæ 6 diu cohærentes	**equisetiformis.**
	Folia laxiuscule subspiraliter disposita. Strobili squamæ 4 demum hiantes	**Whytei.**
3	Strobili squamæ dense grosseque tuberculatæ dorso, marginibus eversis, concavæ	4
	Strobili squamæ læves vel parum tuberculatæ dorso convexiusculæ	**cupressoides.**
4	Folia laxiuscule subspiraliter imbricata, subtetrasticha	**Mahoni.**
	Folia arcte tetrasticha	5
5	Folia obtusiuscula vix carinata. Strobili expansi diam. 20–22 mill. Squamæ 20 mill. long., 10 mill. lat., duo oblongæ duo acutæ. Semina compressiuscula vix angulata	**Schwarzii.**
	Folia oblonga acuta carinata. Strobili expansi diam. 15 mill. Squamæ 23–25 mill. long., 15 mill. lat., duo obovato-oblongæ duo acutæ. Semina angulata.	**juniperoides.**

CHRONOLOGICAL LIST OF SPECIFIC NAMES AND SYNONYMS.

[Synonyms in italics, adopted names in thick type.]

1762. Linnæus, Sp. Plant. ed. 2, p. 1422.
Cupressus juniperoides = **Widdringtonia juniperoides,** Endlicher.

1768. Miller, Gardeners* Dictionary, ed. 8, n. 6.
Cupressus africana, "called by the Dutch Cypress Boom" = **Widdringtonia juniperoides,** Endlicher.

1767. Linnæus, Mantiss. Plant. 125.
Thuia cupressoides = **Widdringtonia cupressoides,** Endlicher.

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* It is worthy of note that the apostrophe or sign of the possessive case is omitted in the titlepage of this book.—ED.

1768. Burman, Flora Indica cum Prod. Flor. Capens. 27.
Thuia aphylla= **Widdringtonia cupressoides.**

1786. Lamarck, Encycl. Méthod. Botanique, ii. 626.
Juniperus capensis= **Widdringtonia juniperoides,** *fide* Endlicher.

1826. Sprengel, Car. Linnæi Systema Veget. ed. xvi. tom. iii. 890.
Schubertia capensis= **Widdringtonia juniperoides,** *fide* Endlicher.

1833. Brongniart, in Ann. Sc. Nat. 1 sér. t. xxx. (1831) p. 196.
Pachylepis juniperoides= **Widdringtonia juniperoides,** Endlicher.
Pachylepis cupressoides= *Widdringtonia cupressoides,* Endlicher.
Pachylepis Commersoni ?

1835. E. H. F. Meyer, Comment. de plant. Afric. aust. .... J. F. Drège. Schrader, ex E. Meyer, Pflanzengeogr. Docum. 73, 170.
Callitris arborea= **Widdringtonia juniperoides,** Endl.

1847. Endlicher, Synops. Coniferarum, p. 32.
Widdringtonia juniperoides.
W. cupressoides.
W. Commersoni ?

1868. Parlatore, in DC Prod. xvi. ii. p. 443.
Widdringtonia juniperoides, Endlicher.
W. Commersoni, Endlicher.
W. cupressoides, Endlicher.

1867. Carrière, Traité Général des Conifères, ed. 2.
Widdringtonia juniperoides, Endlicher.
W. cupressoides, Endlicher.
W. Commersoni, Endlicher.
W. glauca ?= **W. cupressoides.**
W. natalensis ?
W. Wallichii ?

1875. Gordon, Pinetum, ed. 2, pp. 416 *et seq.*
W. Commersoni, Endlicher.
W. cupressoides, Endlicher.
W. juniperoides, Endlicher.
? *W. natalensis,* Endlicher.
? *W. Wallichii,* Endlicher.

1895. Durand et Schinz, Conspectus Floræ Africæ, vol. v. p. 950.
Callitris cupressoides = **Widdringtonia cupressoides**, Endlicher.
Callitris Commersoni = **Widdringtonia Commersoni**, Endlicher.
Callitris juniperoides = **Widdringtonia juniperoides**, Endlicher.

SPECIES DUBIÆ.

Widdringtonia natalensis, Endlicher.
W. Wallichii, Endlicher.

1894. Rendle, in Trans. Linn. Soc. ser. 2, Bot. vol. iv. p. 60.
W. Whytei.

1905. Marloth, in Engler, Bot. Jahrb. xxxvi. p. 205 c. ic.
Callitris Schwarzii = **W. Schwarzii.**

1905. Masters.
W. equisetiformis.

In drawing up the foregoing notes I have availed myself of the collections at Kew and in the Natural History Museum, and I have been greatly aided by excellent specimens kindly furnished by Mr. E. Hutchins, the Conservator of Forests at Cape Town.

INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

The Royal Society has been engaged for some years past in arranging for the publication of an International Catalogue of Scientific Literature, beginning from the 1st January, 1901. Each science will be represented in an annual volume containing lists arranged under authors and subjects, of all books and papers published during the year; these will be contributed through official channels of information—abroad, by direct control of the respective governments—at home, by means of the various Societies which devote themselves to particular sciences; those Societies whose domains overlap having arranged for mutual cooperation.

The collection of title-slips for the United Kingdom of Great Britain and Ireland as regards

BOTANY

has been undertaken by the Council of the Linnean Society, and they appeal to all botanic workers for support in their endeavour to compile a complete record, by sending notices promptly of all botanic issues to the undersigned.

The third volume, for 1903, is now in the press.

B. DAYDON JACKSON,
General Secretary, Linn. Soc.

NOTICE.

Vol. XXXVI., of which Parts 249–254 are already published, is reserved for the completion of the Chinese Flora.

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Cyrtandraceæ Malayæ insularis novæ.

By Dr. Fr. Kränzlin.
(Communicated by Dr. Otto Stapf, F.L.S.)

[Read 21st December, 1905.]

I propose to publish here a small number of new species of Malayan Cyrtandraceæ, the type-specimens of which are all in the Herbarium of the Royal Botanic Gardens at Kew, and, so far as I know, only there.

It is, of course, unsafe to draw conclusions from a study of a limited number of plants; still, some remarks of a more general character may be permissible. There are among the plants described here four species of *Cyrtandra*. They belong to the vast section *Polynesiæ*, are of Philippine origin, resemble dwarf, branchy oaks, and are all modifications of a type which so far has had its only known representative in *Cyrtandra parvifolia*, C. B. Clarke. Among the *Polynesiæ* they form a small natural group which we may call *Parvifloræ*, after the species which was first made known. Extending the process of subdividing large sections into more or less clearly defined groups of species to the *Decurrentes*, another extensive section of *Cyrtandra*, we find a nucleus of such a group in one of the two species of *Decurrentes* described below. It is *C. rhizantha*, which possesses so peculiar a manner of growth that a special place may be claimed for it. It contrasts as the type of a subsection *Heteroblastæ* with the remainder of the *Decurrentes*, which may be termed *Homoioblastæ*, the latter including another new species of *Decurrentes*, *C. gracilenta*. The sections *Jackianæ*, *Stellatæ*, and *Dispares* are each represented by a single species and do not call for subdividing or rearranging these sections.

Among the new and beautiful species of *Æschynanthus*, *Æ. Fraseriana* is the only one that deserves some special consideration on account of its apparent dimorphism or possible tendency towards diœcism. I have seen a single specimen of it. Of this, all the flowers had well-developed stamen with long filaments, whilst the pistil was so short and imperfect that the specimen must be either considered as the brachystylous form of the species—the complementary macrostylous form being still unknown—or as functionally male. Further observations on

the occurrence of similar modifications among the species of *Æschynanthus* are very desirable, and could, of course, be made best in the field.

CYRTANDRA TUBIFLORA, *Kränzl.*—[Dispares.] Frutex humilis. Caulis ad 45 cm. altus, simplex, in superiore parte foliatus, omnino glaber. Folium alterum omnino obsoletum aut ad rudimentum filiforme reductum, alterum petiolatum, oblongum, acuminatum, subfalcatum, paulum asymmetricum, integrum, margine (et subtus certe in nervis principalibus) parce brunneo-pilosum; folia minima cum petiolo 2 cm. longo, 7 cm. longa, 2·3 cm. lata, maxima 15 cm. longa, 4–4·5 cm. lata. Cymæ dichasiales ex axillis et folii præstantis et folii obsoleti, 1–3-floræ. Pedunculi 1–1·2 cm. longi. Bracteæ magnæ, ovato-lanceolatæ, non in involucrum coalitæ, 2 cm. longæ, 7–8 mm. latæ. Pedicelli brevissimi. Calyx longe tubulosus, apice tantum in dentes 5 triangulares supra lineares æquilongos divisus, fere 2·5 cm. longus, a basi medium fere usque minute puberulus. Corolla 4·5 cm. longa, supra tubiformis, 1·8 cm. diam., infra (in calyce) infundibuliformis, lobi transverse oblongi, obtusi, vix diversi. Stamina sesquitorta, antheræ elongatæ, lineares. Stylus in ovarium levissime fusiforme transiens, minute papillosus. Stigma magnum, bilabiatum. Discus et bacca a me non visa (ob flores in parte inferiore partim destructos).—Junio.

North Borneo: Nial, on limestone (*Haviland & Hose*, n. 3537!).

This plant resembles very much *Cyrt. oblongifolia*, Benth. & Hook., but one leaf of every pair is reduced to a little scale, the last remnant of the petiole, the leaves are thinner and black when dry, whilst in *Cyrt. oblongifolia* they assume a rusty or cinnamon colour. The flowers are larger (in our species), especially longer, and are also black in the dried state.

CYRTANDRA HYPOCHRYSEA, *Kränzl.*—[Stellatæ.] Fruticosa. Rami stricti, validi, subquadranguli; vetustiores cortice griseo profunde sulcato fragili tecti, juniores pallide ferrugineo-villosi. Folia satis longe petiolata, opposita, æqualia v. vix diversa, symmetrica, oblonga, acuta v. subacuminata, margine distanter dentata et leviter undulata, supra intense viridia, leviter arachnoideo-pilosa (pilis detersilibus), subtus pallidiora et in nervis omnibus chryseo- v. pallide ferrugineo-villosa, pilis sericeis nitidis, textura satis firma; petioli satis crassi, 2–4 cm. longi, pallide flavido-villosi; laminæ 5–10 cm. longæ, 2–4·5 cm. atæ. Flores in cymas dichasiales dispositi pallide flavi; pedunculi 2–3 cm. longi, stricti, ut calyces corollæque extus dense villosi. Bracteæ anguste ovatæ, acuminatæ, basi liberæ, 2 cm. longæ, basi 8–10 mm. latæ. Bracteolæ pedicellos multo superantes. Calycis segmenta linearia, e basi latiore attenuata, 1 cm. longa, corollam subæquantia. Corolla 1·4 cm. longa, supra 1 cm. diam., tubulosa, extus densissime villosa, intus glandulis minutis undique obsita; lobi inter se vix diversi, transverse oblongi, acutiusculi. Stamina geniculata; filamenta infra paulum latiora; antheræ conglutinatæ. Stylus longiusculus, pilis glanduligeris fere capitatis vestitus. Bacca oblonga, quam calyx brevior, dense mamillosa. Discus uno latere humilior, ceterum integer.

Philippines: North Luzon, Prov. of Benguet (*Loher*, n. 4233!).

The plant is nearest to *Cyrt. chrysea*, C. B. Clarke, but the inflorescences, though much shorter than the leaves, are stalked, and the flowers are larger, especially the calyx. It is also allied to *Cyrt. reticosa*, C. B. Clarke, but the leaves are smaller and longer petiolate. The disk, so far as I could make out, is very small, especially on one side, but it is indeed circular and not one-sided.

CYRTANDRA RHIZANTHA, *Kränzl.*—[Decurrentes.] Caulis hypogæus, repens, ramosus, cataphyllis mox deciduis obsitus, multiarticulatus; caulis epigæus certe altus, quadrangularis, sulcatus, 6–7 mm. crassus, glaberrimus. Folia opposita, longe petiolata, asymmetrica s. leviter falcata, altera parte magis in petiolum decurrentia, supra et subtus etiam in nervis glabra; nervi principales utrinque 16–18, angulum 45–60° cum nervo mediano efficientibus; margo obscure denticulatus; petioli 6–12 cm. longi; laminæ ad 32 cm. longæ, ad 14 cm. latæ. Flores in cymas paucifloras dispositi. Bracteæ sub anthesi nullæ. Pedunculi 1 cm. longi. Calyx tubulosus, bilabiatus, 1·5 cm. longus; lobi 3 breves triangulares, 2 (labium inferius) elongati reflexi. Corolla 2·5–2·8 cm. longa, e basi globosa angustata, subcampanulata, quam calyx duplo longior, manifeste bilabiata; lobi labii superioris approximati, transverse oblongi, ab illis labii inferioris quorum intermedius major sejuncti. Stamina corollam excedentes; filamenta filiformia, valde tortuosa, glabra; antheræ subglobosæ, non conglutinatæ. Discus brevis, 5-lobus.

Ovarium brevi-stipitatum, longe fusiforme, in stylum corollam æquantem attenuatum. Stylus parce glanduloso-pilosus. Stigma orbiculare, excavatum. Bacca 1·5 cm. longa, 6 mm. crassa (maxima, quam vidi).—Augusto.

Celebes: Forest at the mouth of the valley Tiram (?) (*de la Savinière*, n. 138!).

Differs from *Cyrt. radiciflora*, C. B. Clarke, in the leaves, which are by far larger and glabrous on both sides and less serrate. The flowers also are larger and the stamens and the style longer. I believe it is better to separate this species from the other "*Decurrentes*," the flowers being produced on separate short branches arising directly from the subterranean stem or rhizome, whilst the leaf-bearing stem is flowerless. For this reason I propose to establish a new subsection "*Heteroblastæ*," in contradistinction to the "*Homoioblastæ*," which produce stems with flowers in the axils of still existing leaves, as in the majority of the species, or in the axils of decayed leaves, as in *Cyrt. radiciflora*, C. B. Clarke.

CYRTANDRA GRACILENTA, *Kränzl.*—[Decurrentes.] Caulis herbaceus, tetragonus, sulcatus; internodia 3·5–5 cm. longa, suprema tantum leviter pilosa. Folia æqualia, opposita, petiolata, lanceolata, acuminata, remote dentata, in margine levissime pilosa (præsertim in dentibus), ceterum utrinque glabra, supra opaca, viridia, subtus multo pallidiora, juniora pilis brunneis mox deciduis villosa, 12–20 cm. longa (incl. petiolo 2–3 cm. longo), 3–3·5 cm. lata, basi æqualia. Cymæ dichasiales sessiles, trifloræ. Bracteæ in involucrum 5–6 mm. longum urceolatum extus brevi-pilosum utrinque acutum 5–6 mm. longum coalitæ. Calyx 1 cm. longus, quam bracteæ duplo longior, dense longeque villosus; segmenta longe linearia. Corolla elongata, flavida, 3 cm. longa, fauce 1·5–1·8 cm. lata, infundibuliformis, lobulis æqualibus rotundatis, extus fulvido-villosa, fauce minute papillosa. Antheræ subquadratæ. Filamenta linearia, corollæ æquilonga, minute pilosa. Staminodia minuta. Stylus æquilongus, glaber. Stigma magnum, oblongum, valde papillosum.

Borneo: near Datar (Dater?) (*Curtis! comm. Veitch*).

The plant is very near *Cyrt. navicellata*, Zippel, but the leaves are narrower, the petiole much shorter, and the corolla twice as long as in that species. There are only very few flowers with the specimen, and I confess I have not seen the disk; but the plant is in all respects so near to *Cyrt. navicellata*, that its position next to that species cannot be doubtful.

CYRTANDRA CRETACEA, *Kränzl.*—[Jackianæ.] Caulis lignosus, repens, passim radicans, apice tantum foliatus. Folia 8–9 congesta, opposita, æqualia, longe petiolata, elliptica, obtusa, margine integra, leviter undulata, supra glabra, excepto nervo mediano medium usque minute ferrugineo-puberula glauca v. albida, subtus eleganter reticulata; nervi omnes necnon petioli brunneo-villosi; petioli 7 cm. longi; laminæ æquilongæ, 3·5 cm. latæ. Flores in tot cymas v. dichasia plerumque uniflora quot folia dispositi, floribus lateralibus obsoletis. Pedunculi 1·5 cm. longi, ut bracteæ in involucrum coalitæ extus dense villosi. Involucrum profunde fissum; segmenta late oblonga, apice barbata. Pedicelli brevissimi. Calyx floris ut videtur mox deciduus, fere basin usque fissus, involucrum subæquans, 6 mm. longus, extus dense pilosus. Corolla quam calyx duplo longior, infundibuliformis, extus sparse longeque pilosa; lobi subæquales, ovato-oblongi, labia igitur haud distincta, 1–1·2 cm. longa. Stamina elongata; filamenta medio dilatata, geniculata; antheræ oblongæ, arcte conglutinatæ. Staminodia elongata, filiformia. Ovarium oblongum, dense pilosum. Stylus brevis. Discus brevis, minutus. Bacca oblonga, papillosa, involucrum post anthesin auctum paulum excedens, ad 7–8 mm. longa, 4 mm. crassa.—Junio.

North Borneo: Niah, on limestone (*Haviland & Hose*, n. 3530!).

The peculiar feature and the beauty of this little plant is in the leaves. They are, on the upper surface, whitish green, or in the living state glaucous, probably with a silky lustre; on the underside they are covered with an elegant network of numerous anastomosing veins clothed with dark brown silky hairs. The bracts forming the so-called involucre are bearded at the top and free nearly to the base; they increase after flowering and protect the berry better than the thin and quickly vanishing calyx. The nearest species is *Cyrt. bicolor,* Jack; but this has a monophyllous involucre containing many flowers of larger size.

CYRTANDRA MACRODISCUS, *Kränzl.*—[Polynesiæ.] Frutex debilis. Rami tenues, flaccidi, glabri, juniores tantum brunneo-pilosi. Folia opposita, valde inæqualia, symmetrica, petiolata, lanceolata, acuta acuminatave, remote grosse dentata, supra opaca, viridia, subtus pallidiora, in nervis tantum ut etiam in petiolo brunneo-villosa, 5–8·5 longa, 1–2·5 lata (incl. petiolo 1 cm. longo); nervi primarii 5–6. Flores in dichasia brevissima plerumque monantha dispositi; interdum flos primarius diu ante laterales evolutus, aut laterales abortivi. Bracteæ ovatæ, acutæ, liberæ, ut pedicelli et calyces extus longe brunneo-villosæ. Pedicelli 5 mm. longi. Bracteolæ æquilongæ. Calyx medium usque campanulatus, sub anthesi 1 cm. longus, lobis linearibus apice ipso paulum incrassatis. Corolla ampla, tubulosa, bilabiata; lobi labii superioris reflexi, breviores, illi labii inferioris breviores, deflexi, omnes rotundati; tota corolla extus albido-villosa, intus sparse papillosa, ceterum glabra, fere 2 cm. longa, lobis patentibus, fauce lata, lobi 5 mm. longi, 3–4 mm. lati. Stamina rectiuscula, paulum torta. Filamenta linearia, nuda. Antheræ late oblongæ, conglutinatæ. Staminodia satis longa, apice antheram valde reductam sterilem gerentia. Discus pro flore magnus, 5-lobus. Ovarium dense ferrugineo-villosum. Stylus breviusculus, supra glanduloso-pilosus, in ovarium transiens. Stigma oblongum, parvum. Bacca inter formam cylindraceam et obconicam intermedia, ad 1·2 cm. longa, superne 6 mm. diam.

Philippines: North Luzon, Prov. of Benguet (*Barnes, Forestry-Bureau*, n. 921!).

This is a little, much-branched shrub. The leaves resemble in some way those of certain oaks. The flowers are more distinctly bilabiate than in many other species of the Polynesian group; the disk below the ovary is rather large compared with the small ovary. The berry has a tendency towards becoming obconical, outgrows the calyx in diameter, and exceeds by far the small bracts, which are free to the base. On the whole it is a somewhat aberrant type among the "Parvifloræ" of the Polynesiæ.

CYRTANDRA MICRANTHA, *Kränzl.* — [Polynesiæ.] Frutex. Rami paulum flexuosi, basin versus glabri, teretes, novelli brunneo-villosi. Folia opposita, inæqualia, plerumque symmetrica, rarius paulum asymmetrica, petiolata, lanceolata, acuminata, paulum et remote dentata, juniora omnius ferrugineo-villosa, adulta supra opaca, viridia, subtus pallidiora, in margine sparse, in nervis densius brunneo-villosa. Petioli 1–1·5 cm. longi, dense pilosi. Laminæ 10–14 cm. longæ, 4 cm. latæ; nervi primarii utrinque 8. Cymæ densiusculæ, subcapitatæ, brevi-pedicellatæ; pedicelli, bracteæ, calyces longe brunneo-pilosi. Bracteæ in involucrum coalitæ, post anthesin deciduæ, ovatæ, acutæ, subtus valde nervosæ. Pedicelli brevissimi, quam bracteolæ breviores. Calycis 6 mm. longi brevi-campanulati, segmenta linearia, tres quartas corollæ æquantia. Corolla campanulata, extus et intus glabra, 8–9 mm. longa, supra 6 mm. diam.; lobi paulum diversi, transverse oblongi, rotundati. Stamina linearia, glabra, valde curvata; antheræ non conglutinatæ. Staminodia parva. Discus 5-dentatus. Stylus glanduloso-papillosus. Stigma obscure bilabiatum. Bacca ovalis, dense papillosa, stylo subbreviore coronata, calycem patulum excedens, 6 mm. longa, 3–4 mm. crassa.

Philippines: Northern Luzon, Prov. of Benguet (*Barnett, Forestry-Bureau*, n. 923!).

This plant is surely very near to *Cyrt. parviflora*, C. B. Clarke; but it differs in the curved stamens, the not cohering anthers, and the glabrous filaments.

CYRTANDRA BENGUETIANA, *Kränzl.*—[Polynesiæ.] Fruticulosa. Rami vetustiores subtetragoni, grisei, glabri; juniores brunneo-villosi. Folia opposita, paulum inæqualia, lanceolata, basi et apice longe acuminata, utrinque paucidentata, brevi-petiolata, paulum asymmetrica, margine revoluta, tenuiter coriacea, supra viridia, subtus pallida, margine et in nervis majoribus brunneo-pilosa; nervi primarii utrinque 7–8; folia novella omnino aureo-villosa. Cymæ breves et brevi-pedicellatæ in axillis foliorum. Pedunculi, pedicelli, bracteæ, calyces extus omnia rufo-pilosa. Bracteæ persistentes, parvæ. Calyx fere basin usque fissus, 5 mm. longus; lobi e basi paulum latiore lineares, satis longi, apice incrassati. Corolla 7 mm. longa; tubus longiusculus, fauce 3 mm. latus, calycem bene excedens; limbus in lobos parvos rotundatos subæquales divisus. Filamenta valde torta. Staminodia conspicua, filiformia. Discus satis altus, breviter lobus. Bacca oblonga, in stylum brevem attenuata, 5 mm. longa.

Philippines: North Luzon, Prov. of Benguet (*Loher*, n. 4237! 5039!). The same locality (*Vidal*, n. 1821!).

The plant is a near ally of *Cyrt. parviflora*, C. B. Clarke; but it differs in the size being even smaller than the preceding species. The very remarkable golden-brownish nerves on the underside of the leaves bring the plant near to *Cyrt. chrysea*,

C. B. Clarke, another small flowering species; but this plant has the leaves larger and covered throughout with golden-yellow hairs.

CYRTANDRA ILICIFOLIA, *Kränzl.*—[Polynesiæ.] Fruticosa, valde ramosa. Cortex ramosum vetustiorum griseus, valde rugosus, glaber, rami juniores necnon petioli dense fusco-villosi. Folia opposita, æqualia, breviter petiolata, acuminata, basi cuneata, paucidentata (dentes utrinque 3–5), supra opaca, viridia, minute pilosa, subtus pallidiora, glabra, nervis primariis (utrinque 5) brunneo-villosis exceptis; petioli 1 cm. longi; laminæ ad 8 cm. longæ, 2–2·5 cm. latæ. Cymæ longe pedunculatæ, dimidium foliorum æquantes, paucifloræ plus minus dichasiales. Bracteæ cymarum acuminatæ; bracteolæ lanceolatæ, minutæ. Calyx campanulatus; segmenta e basi lata triangularia, angulata, linearia, dense pilis setiformibus articulatis brunneis sericeis vestita, 5 mm. longa. Corollæ luteolæ, tubus calycem duplo superans, 8 mm. longus, fauce 4 mm. diam.; labii superi lobi subbreviores quam illi inferioris, rotundati, reflexi; labium inferum sublongius in fauce dense papillosum, quasi pulvinatum, leviter inflatum, lobis antrorsis duplo longioribus. Filamenta semicirculariter curvata. Staminodia longa, capitellata. Stylus stamina excedens, sparse glanduloso-pilosus. Bacca calycem persistentem plus duplo superans, ovata, papillosa, 5 mm. longa, 3 mm. crassa.

Philippines: Northern Luzon, Prov. of Benguet (*Loher*, n. 4235! 4236!). The same locality (*Vidal*, n. 1669!).

A little shrub resembling *Quercus Ilex* in foliage. In the structure of the flowers it comes near to *Cyrt. parviflora*, C. B. Clarke, but it is more slender in all parts, and, as regards the flowers, perhaps the most inconspicuous plant of the whole genus, and the name "*parviflora*" would no doubt be more appropriate to it than to the plant so named.

ÆSCHYNANTHUS CORDIFOLIA, *Kränzl.* — [Holocalyx § 1.] Caulis pars quæ adest stricta, glaberrima. Folia pro planta parva, breviter petiolata, cordata, ovata, apice ipso obtusa, carnosula, supra glabra, subtus minute puberula, margine ciliata; petiolus pilosus, 4 mm. longus; lamina 2·5 cm. longa, basi 1·5 cm. lata. Flores in cymas dispositi. Cymæ 2–3-floræ, in apice caulis terminales, subumbellatæ. Pedunculi 5 cm., pedicelli 2 cm. longi, reflexi. Bracteæ a me non visæ sub anthesi jam delapsæ. Calyx magnus, urceolatus v. subcylindraceo-obconicus, 3·5–4 cm. longus, glabriusculus, in lobos late triangulos obtusos divisus; lobi 6–7 mm. longi, basi 5 mm. lati. Corolla calyce duplo fere longior, 6–7 cm. longa, leviter curvata purpurea; lobi labii superioris parvi, approximati, illi labii inferioris laterales, magni, rotundati, intermedius transversus, emarginatus (?); tota corolla minute pilosa. Stamina majora paulum breviora quam corolla, minora in fundo obcelata. Stylus etiam brevior? Discus parvus, retusus.—(?).

Ternate or Tidor (*Curtis? comm. Veitch!*).

The leaves are rather small, and even smaller than those of *Æsch. parvifolia*, R. Br.; they are exactly cordate, a shape not observed (at least not reported) so far. The stamens are very short, and shorter than in the allied species, viz. *Æsch. javanica*, Rollins, and *Æsch. Curtisii*, C. B. Clarke.

ÆSCHYNANTHUS RHODOPHYLLA, *Kränzl.*—[Holocalyx § 1.] Caulis repens, passim radicans, præsertim apice pilosus. Folia opposita, crebra; internodiis 2 cm. longis inter se distantia, breviter petiolata v. subsessilia, ovata, obtusa, crasse carnosa, supra glabra, viridia, subtus sparse pilosa, violacea v. rosacea (etiam sicca), cum petiolo 1–1·5 mm. longo, 2·5–2·8 cm. longa, 1–1·3 cm. lata, sicca convexa. Cymæ terminales ut videtur pauci-(2–3-)floræ. Pedunculi 1 cm. longi. Bracteæ a me non visæ. Pedicelli dense fusco-glanduloso-pilosi, vix 1 cm. longi. Calyx tubulosus, apice brevidentatus, extus dense fusco-pilosus, fere 2·5 cm. longus, apice 8 mm. diam.; lobi vix 2 mm. longi. Corolla anguste cylindracea, extus dense pilosa pilis glanduligeris et setaceis intermixtis, calycem fere duplo superans, superne curvata, fauce angusta; lobi subæquales, rotundati, illi labii inferioris paulum producti; tota corolla atropurpurea, ad basin loborum intus pallidiora, 4–4·5 cm. longa. Stamina longiora corollam vix superantia, breviora, illam æquantia. Antheræ omnes leviter cohærentes, oblongæ; filamenta pilis longis glanduligeris sparsis vestita. Stylus æquilongus, per totam longitudinem dense pilosus. Discus brevis, 5-partitus. Capsula matura, ultra 20 cm. longa.

North Borneo, near Kushing (*Dr. Haviland*, n. 1513!).

The species nearest to this are *Æsch. parvifolia*, R. Br., and *Teijsmanniana*, Miq.; but it differs from both in its very small, convex leaves which have a pale rose-coloured hue, especially on the underside. The specimens having been collected too late, all the flowers were faded too much for a perfectly satisfactory analysis; but the characters mentioned in the description are sufficient to establish a new species.

ÆSCHYNANTHUS HOSEANA, *Kränzl.*—[Holocalyx §2.] Caulis gracilis, repens, ad nodos omnes radicans; internodia 2·5–4 cm. longa. Folia æqualia, petiolata, oblonga ellipticave, obtusa v. breviter acutata, satis tenera, haud coriacea, glabra ut tota planta; petioli 8–10 mm. longi; laminæ 2·5–4·5 cm. longæ, 1·2–2·5 cm. latæ, subtus pallidiores. Pedunculi brevissimi, vix 5 mm. longi. Flores 1–3 longius pedicellati. Bracteæ non in involucrum coalitæ, obovato-oblongæ, obtusæ, 7–8 mm. longæ, ad 5 mm. latæ. Pedicelli 1·5 cm. longi. Calyx tubulosus v. subcylindraceus ore paulum ampliato, 1·5 cm. longus, 5–7 mm. diam.; lobi breves, triangulares, acuti, vix 2 mm. longi. Corolla purpurea, 2·5 cm. longa, fauce 7–8 mm. diam., quam calyx subduplo longior, non curvata, extus glaberrima; lobuli labii superioris stricti, rotundati, margine ciliati, illi labii inferioris ovato-triangulares, reflexi, medio puberuli. Stamina tubum corollæ bene superantes, minute puberula. Stylus cum ovario vix crassiore, disco crasso vix lobulato insidens, gracilis; stigma magnum, minute bilobum; capsula a me non visa.—Novembri.

North Borneo: Saribas (*Haviland*, n. 3528!).

This differs from all the other species of this section in its creeping stems which root from all the nodes, and in the glabrousness of all parts excepting the inside of the three inferior corolla-lobes and the filaments.

ÆSCHYNANTHUS FRASERIANA, *Kränzl.* — [Polytrichium.] Caulis certe longus, radicans, satis validus, glaberrimus, multiarticulatus; internodia 3–6 cm. longa, ad nodos incrassata. Folia breviter petiolata, elliptica, basi rotundata, apice subacuta, coriacea, glabra; juniora et caulis partes novellæ mihi non visa, supra enervia, subtus minute reticulata, 6–7·5 cm. longa (incl. petiolo 5 mm. longo), 2 cm. lata. Pedunculi pauciflori, brevissimi, axillares, 6–8 mm. longi. Pedicelli subnulli. Bracteæ brevissimæ, liberæ. Calycis segmenta linearia, e basi paulo latiore angustata, quam pars coalita brevis cupuliformis ter longiora, totus calyx ad 2 cm. longus, sub lente valido minutissime pilosus. Corolla calycis lobos non excedens, breviter cupularis, leviter v. vix curvata, obscure labiata; lobi vix inter se diversi, rotundati, margine rotundati, ciliati, illi labii inferioris paulum breviores, omnes conniventes v. vix patuli, corolla 2 cm. longa, superne 1 cm. diam. Stamina corollam fere duplo superantia; filamenta tenuissima, pilosa; ad insertionem filamentorum et staminodii minuti linearis, *i. e.* in fundo corollæ paulum supra basin 5 pulvinaribus pilorum articulatorum satis crassorum instructa; filamenta 2 cm. longa, 1 cm. supra fundum corollæ inserta. Discus magnus, obscure 5-lobus. Ovarium cum stylo brevissimum, discum vix excedens. Stigma parvum. Capsula et semina non adsunt.—Aprili.

British North Borneo, near Marisinsing (*Dr. Fraser*, n. 268!).

The plant differs from *Æsch. Motleyi*, C. B. Clarke, in the size and the shape of the leaves, in its shorter calyx-lobes, and in the size and shape of the pistil; in other respects both species are much alike. So far as we can judge from the specimen at hand, there must be still a macrostyle form with shorter stamens to be detected.

On *Characeæ* from the Cape Peninsula collected by Major A. H. Wolley-Dod, R.A. By Messrs. H. & J. Groves, F.L.S.

[Read 21st December, 1905.]

(Plate **11**.)

This small collection of eight numbers, representing seven species, was made by Major Dod in 1895–7 on Table Mountain and the adjacent hills, and the records are published in the 'List of Flowering Plants and Ferns of the Cape Peninsula,' compiled by him in conjunction with Mr. Harry Bolus. Among them are two of our common European species, *C. vulgaris* and *C. fragilis*, the rest being apparently endemic to Africa and one being a new species. Major Dod informs us that in the districts he visited these plants were very scarce.

During the earlier half of last century a number of Characeæ were collected in Cape Colony and Natal by German botanists; but since that time little has been done in this direction, and the material in our National Herbaria is extremely scanty. The most interesting feature of the *Chara*-flora of Cape Colony is the presence of species intermediate between the two sections Diplostichæ and Triplostichæ, which in other parts of the world are fairly distinct.

CHARA FRAGILIS, *Desvaux, in Loisel. Notice aj. Fl. France,* 1810, p. 137.

Vaarsche Vley, 11th Nov. 1897. No. 3561.

A large stout form near the var. *Hedwigii*, Kuetz.

C. TANYGLOCHIS, sp. nova. Caulis tenuis, diplo- vel triplostiche corticatus. Aculei plerumque solitarii, magnitudine valde inæquales, sæpissime mucronato-papilliformes, sed infra nodos nonnullos elongati etiam usque ad duplicem caulis diametrum. Stipulodia admodum evoluta, cellulis serierum utrisque fere æqualibus, binorum quisque sæpe super pediculum sitis. Ramuli verticillorum 8–9, articulis corticatis plerumque 5, ecorticatis 1–2, nodis fertilibus 2–3. Bracteæ ad nodos fertiles 6–8, posteriores 1–2, abbreviatæ nonnunquam mucronato-papilliformes, laterales longe acuminatæ fructum duplo superantes. Fructus longitudine circa ·8 mm., crassitudine circa ·47 mm.; coronulâ longitudine ·13–·14 mm., ad basin crassitudine ·2 mm.; nucleo atro, circa 15–16 strias exhibente. Antheridium diametro ·27–·35 mm. Monoica.

Ditch by the railway, near Muizenberg Vley, Cape Colony, 14th Nov. 1897. No. 3564.

A small slender plant resembling *C. fragilis.* Branchlets of the lower whorls straightish. Upper internodes rather short. Like the diœcious *C. Kraussii*, its relationship seems to be rather with *C. fragilis* and *C. aspera* than with other Diplostichæ, although the cortex is diplostichous rather than triplostichous. The sharp, well-developed, prominent stipulodes, each pair often on a definite stalk, and the conspicuously acuminate bract-cells, as well as the monœcious character, readily distinguish it from *C. Kraussii* and *C. stachymorpha.*

H. Groves del.
J. N. Fitch lith.

West, Newman imp.

CHARA TANYGLOCHIS

C. KRAUSSII, *Kuetz. Tab. Phyc.* vol. vii. (1857) p. 22, t. 53. C. phæochiton, *A. Braun, Monatsb. königl. Akad. Berl. for* 1867 (1868) p. 861.

Pools close to Fish Hoek Station, 30th Oct. 1897 ; no. 3505.—Vygeskraal River above Uitvlugt, 3rd Nov. 1897 ; no. 3578.

C. STACHYMORPHA, *Ganterer, Die bisher bekannt. Oesterr. Charen* (1847) p. 19. C. Kraussii *var.* stachyomorpha, *A. Braun, l. c.* p. 859.

Muizenberg Vley, 14th Nov. 1897. No. 3563. Male plant only.

We have not had an opportunity of examining the type of this species, but the present plant agrees exactly with Braun's description of it. It is, however, important to note that the cells at the base of the branchlets, representing undeveloped stipulodes, are in a single series only, which would appear to place the species in the group Haplostephanæ.

C. CAPENSIS, *Kuetz. Tab. Phyc.* vol. vii. (1857) p. 28, t. 71.

Vygeskraal River, 27th Dec. 1895. No. 544.

C. VULGARIS, *Linn. Species Plant.* (1753) vol. ii. p. 1156.

Hout Bay. No. 3326.

A form with small papilliform spine-cells and very blunt bract-cells.

NITELLA DREGEANA, *Kuetz. Sp. Alg.* (1849) p. 517. N. tricuspis, *A. Braun, l. c.* p. 805.

Raapenberg Vley, 21st Oct. 1897. No. 3114.

The present plant belongs to the var. *grandis* of Braun's *N. tricuspis.*

EXPLANATION OF PLATE 11.

Fig. 1. Plant. Natural size.
2. Branchlet. × 15.
3. Stem, showing long spines. × 30.
4. Fruit. × 30.
5. Cortex, showing short spines. × 30.
6. Ends of bract-cells. The inner lines towards the apex show the thickened cell-wall and spine-like points. × 60.
7. Coronula. × 60.
8. Stipulode, side view. × 30.

On some Endophytic Algæ.

By A. D. Cotton, F.L.S., Assistant, Herbarium, Royal Botanic Gardens, Kew.

[Read 18th January, 1906.]

(Plate 12.)

Species of Endophytic Algæ are found amongst several genera belonging both to the Phæophyceæ and to the Chlorophyceæ. All are microscopic forms the thallus of which is represented either by filaments or plates of cells which grow in the tissues of larger Algæ. In some cases the endophyte is found in the gelatinous walls of the external surface of the host-plant; in others, the filaments penetrate deeper into the host and are found running between the cells of the thallus-tissue. In neither case is the invading plant necessarily parasitic.

The genus *Endoderma* among the greens and *Streblonema* among the browns may be taken as representatives of Endophytic Algæ from these two groups. In *Endoderma* the entire life-history of the plant is (with a few exceptions) endophytic, save for a few colourless hairs and the liberated zoospores. But in *Streblonema*, though the main mass of tissue is within the host-plant, the reproductive portion is always produced outside. Huber's researches on the former and Sauvageau's on the latter have added much to our knowledge of this group of plants.

The object of the present paper is to record some observations on the life-history of *Endoderma virida* (Rke.), Lagerh. Two species of *Streblonema* are also dealt with.

As to material, fresh algæ were examined when possible, but specimens preserved in formalin yielded very good results.

As recorded later, *Endoderma viride* was found abundantly in the tissues of *Nitophyllum Hilliæ*. This latter plant is a deep-water alga and is never found exposed, consequently it had to be obtained by means of dredging. During spring-tides it may occasionally be found on the steep surfaces of rocks just below low-water mark. It is also sometimes thrown up after a storm, and such specimens though torn and imperfect are quite fit material for the examination of *Endoderma*, as the endophyte is protected within the tissues.

The bulk of the material was obtained by dredging; and here the writer would like to express his best thanks to Dr. E. J. Allen for his kindness in giving him opportunities for dredging, and also every facility for study and research in the Laboratory of the Marine Biological Association at Plymouth.

For ascertaining the range of species invaded by the endophytes, dried specimens have been examined, and, in the case of *Endoderma*, these answered well. The large collections of dried Algæ at Kew were most valuable for this purpose.

ENDODERMA.

The species of *Endoderma* examined was that occurring in various Nitophylleæ, generally accepted as *E. viride*, Lagerh.; it was first described by Reinke (1) and found by him in *Derbesia Lamourouxii*. Its appearance in *Nitophyllum* is somewhat different to that in *Derbesia*. Reinke moreover did not succeed in discovering the fruits. In one species of *Nitophyllum*, viz. *N. Hilliæ*, *Endoderma* presents a constant and definite appearance, and in the right season the fruits are particularly abundant. Algologists will find this host useful for the examination of a definite form of *E. viride*, and one which almost always provides the material required. It is also tolerably well suited for artificial cultures.

Huber, 1882, in his admirable monograph of the endophytic Chætophoreæ (2), brings together in a useful way the various endophytic genera of the Chlorophyceæ. He gives a detailed account of the genera and species, and full references will be found in his paper to literature published previous to 1882. Amongst other genera there mentioned is *Endoderma*, which he divides into two sections: *Ectochæta*, those species possessing external hairs; and *Entocladia*, those without these structures. *E. viride* was not examined by Huber, though he gives it a place in the latter section.

Reinke, in first describing the endophyte in *Derbesia*, named it *Entocladia viride*; he was unable to describe the fruits, but surmised that the affinity of the plant would be with *Stigeoclonium*. His fig. 8 rather suggests a young sporangium, and Reinke himself draws attention to the possibility of this, but he leaves the question undecided. Wille (3), in 1880, described the fruit for the first time in a form occurring in species of *Ectocarpus*, and named the plant *Entocladia Wittrockii*. Lagerheim (4), in 1883, replaced Reinke's generic name *Entocladia* by that of *Endoderma*.

In the Kew Herbarium there are some specimens of *Derbesia Lamourouxii* collected at Nice and these are richly infected with *Endoderma*. The endophyte in the specimens agrees exactly with that described by Reinke, and, like his plants, is without fruits. A special search was made for these, but without success; even where the endophyte was quite old and had formed an almost pseudoparenchymatous mass, no trace of fruit could be seen. The absence of fruit in the endophyte in *Derbesia* is unfortunate, as it renders absolute certainty as to the identity of Reinke's plant impossible.

A comparison of the vegetative character of the endophyte in *Derbesia* with that of *Nitophyllum Hilliæ* shows a close agreement in form and structure; and sufficient, it is thought, to justify the opinions of previous authors (**5**), (**6**), that the same plant is in question in both cases. For the present, therefore, the writer is content to regard the plant, so frequently invading the tissues of *Nitophyllum*, as the same species as that described by Reinke. In view of any possible discoveries in the future of the fruit of the endophyte in *Derbesia*, he would, however, like to distinguish the plant he has examined by naming it *Endoderma viride* (Rke.), Lagerh., forma *Nitophylli*.

In *Nitophyllum* and allied Florideæ, *Endoderma* frequently forms large spreading patches which may be readily detected at a glance. *N. Hilliæ*, which is found in deep water on the south coast of Britain, is particularly liable to infection; indeed it is rare to find any but very young specimens which do not show the filaments under the microscope, even though the green blotches be not visible to the naked eye. In this species of *Nitophyllum* the green spots or blotches are often of large size, and in old, badly infected plants the whole lamina appears green. In other species quite a different appearance is presented by the *Endoderma*, but this will be referred to later.

In the summer and autumn months the fruit-bodies may be found abundantly in *N. Hilliæ* in the green blotches referred to, and even in the portions of the *Endoderma* plants that are apparently quite young; a fact which is noticeable at once, because in other hosts, e. g. *Delesseria*, the fruit-bodies are much more difficult to obtain.

Under a low power of the microscope the bright green filaments are seen following the outlines of the cells; a section through the frond, however, shows that as a rule in this host they are not intercellular, but run along in the outer layers of the cell-walls.

Fig. 1 (Pl. 12) shows the appearance of *Endoderma* as seen from above in *N. Hilliæ*. The jointed filaments, of which it is composed, branch and spread out over the frond in a radiating manner and at first follow the outlines of the cell-walls as seen from above. Why they take this course is not clear, presumably it is because they find it easier to penetrate along the lines of junction of the cells; and this may possibly be accounted for by some slight difference in the character of the cellulose. In somewhat older stages, owing to repeated branching and further growth, the *Endoderma*-cells may lie so closely together that they form an almost pseudoparenchymatous mass (lower part of fig. 1). The average width of the cells in the younger portions is 5–6 μ, and the length is generally two to three times as much. The terminal cell is usually considerably longer. In still older parts the cells become rounded and oval in shape, previous to zoospore-formation.

A transverse section of the *Nitophyllum* frond shows that while growth is mostly parallel to the surface, the endophyte occasionally sends filaments down into the thallus as shown in fig. 2. This is somewhat unusual for an *Endoderma*, for as a rule the filaments do not penetrate below the outer membrane. Oltmanns (7. p. 305) for this reason classes *Endoderma* with his first group of Endophytes and not with the second.

With regard to the minute structure of *Endoderma*, a single parietal chromatophore is found in each cell and there is one pyrenoid. (The presence of a single pyrenoid is a point of agreement with Reinke's *E. viride* in *Derbesia*, whereas in Huber's *E. leptochæte* in *Ceramium* there are three). The cell-membrane is not so obvious as in the case of other species, but by the use of reagents it can readily be brought into prominence. *Endoderma* grows by apical growth, as is the case in all endophytic filaments.

When zoospore-formation is about to take place, the ordinary cells of the filament separate from each other and round themselves to form zoosporangia. Apparently any or all of the older cells may in this way form fruit. The contents of the cell divide up by successive division until usually eight zoospores are formed;

in some cases there may be sixteen. A transverse section of the *Nitophyllum* frond shows that the zoosporangia lie in the wall of the host-plant in the same way as the vegetative cells described above. The zoospores as they are contained in the sporangium measure about 5 μ in diameter; if sixteen zoospores are formed they are usually somewhat smaller. Fig. 2 shows a section of the frond of *Nitophyllum*, and sporangia are seen in various stages of development. The long axes of the sporangia may be parallel to the plane of the thallus or at right angles to it.

As the sporangia mature, a minute beak-like outgrowth is formed which may protrude through the outer layers of the wall of the host. Through this beak-like outgrowth the spores are liberated. In Pl. **12.** fig. 4 stages are given showing the projecting beak and also sporangia in which all the spores but one have been discharged. Entirely empty sporangia are very frequently met with. Attempts to observe the actual escape of the spores were unsuccessful, but in several cases spores were found attached to the *Nitophyllum* thallus sometimes in groups of three or four. The shape of the sporangia is variable, as is shown in fig. 3.

The minute beak in the fruit of *Endoderma* may be compared with what is formed in the allied genus *Phæophila.* In the latter a tube is formed which may be of considerable size.

The germinating spores of *Endoderma* are not frequently seen on *N. Hilliæ.* The endophyte forms large radiating patches and it appears to spread very readily by a purely vegetative method. But sections cut through the younger portions of the frond occasionally show such spores, and the germ-tube may be readily noticed entering the cell-wall of the host. The method of germination appears to agree with that described by Huber for *E. Jardinianum.* When once an entrance has been gained, the plant assumes its usual endophytic habit. Though a very large number of sections were cut through the older parts of the *Nitophyllum*, no trace was ever seen of a germinating *Endoderma*; it seems therefore probable that an entrance can only be obtained by the endophyte in the younger parts of the frond. Whether the sporelings can develope unless a suitable host be present is uncertain; and in any case the plant has probably become too specialised as an endophyte, to live independently for any length of time. That a certain amount of development, however, is not impossible is shown by observations made by Oltmanns and others (**7.** p. 344). Not only endophytes, but also parasites have been recorded as developing on glass dishes in artificial cultures.

The question of the infection of *Nitophyllum* in the spring raises some points that cannot yet be explained. So far as is known, *N. Hilliæ* is an annual plant, it dies away in the winter, and therefore no home can be found for *Endoderma* in its tissues till the following spring. What becomes of the *Endoderma* spores that are formed in abundance in late autumn? Presumably they germinate at once. Other species of *Nitophyllum* do not throw any light on the subject. *N. laceratum*, the commonest British species, grows throughout the whole year, but it is remarkable for being entirely free from *Endoderma* (see later). It is possible that the spores may infect entirely different genera during the winter months, such as *Ceramium* or *Delesseria*. This can only be verified by carefully carried out artificial cultures.

The growth of *Endoderma viride* forma *Nitophylli*, in contrast to some other species (e. g. *E. gracilis*), takes place entirely within the substance of the host-plant, and there is no trace whatever of external branches or hairs. This character, taken together with the occasional production of filaments which run along the middle lamella of the inner tissues of the host, points to its being most adapted to an endophytic mode of existence, and that it has probably grown longer under such conditions, than forms that produce external hairs.

At the same time, there is no evidence to show that the plant is in any way parasitic. The presence of chlorophyll and the entire absence of any haustoria-like organs do not suggest it; on the other hand, the cells of the host are perfectly healthy even though it be richly infested. In late autumn *Endoderma* is still found flourishing in the tissues of *Nitophyllum*, but there is no reason to suppose that the decay of the fronds is hastened by its presence.

Before coming to the list of plants infected by *Endoderma*, a point in the general morphology may be noticed. The filaments, when in the thallus of *N. Hilliæ*, are as a rule moderately regular in width and general form. An exception to this occurs, however, when the endophyte passes over tissues other than those of the ordinary large cells of the thallus. This is particularly obvious in the case of antheridia, which form broad patches on the surface of the ordinary frond. When *Endoderma*-filaments pass over such patches their appearance is entirely altered. The regularity in width is lost, and very fine filaments are often formed with swollen portions occurring at intervals. Such alteration in the form of cells, which is often noticeable even in the case of individual filaments, is instructive as showing that the character of the tissue of the host-plant may materially affect the form of the cells of the invader. It is not likely that food-supply is in question here, as *Endoderma* is not regarded as being parasitic. It may be that the growth of the antheridial cells may be more rapid than that of the endophytic filaments, and thus the latter may assume an irregular course. The fact above referred to is not without importance when defining specific differences. In dealing with endophytes, allowance has to be made for the host-plant and too much weight must not be attached to minute morphological differences.

The remarks which follow relate to the presence of *Endoderma viride* forma *Nitophylli* on other hosts. A large number of infected species of *Ceramium*, *Chylocladia*, and other red algæ have been examined; but it is difficult in most cases to speak with certaintly as to the identity of the endophyte they contain. The fruiting material is rarely obtainable. In some cases two or even more species are probably present, though undoubtedly some species are very variable in appearance. A further account will, it is hoped, be published later, when the life-history of other species is better known and it will be possible to speak with more certainty as to their identity.

The following observations have so far been made:—

Nitophyllum punctatum.—*E. viride* is not infrequently found in this species; the attacked areas are, however, not so diffused as in *N. Hilliæ*, but more often have the form of bright green spots. Zoosporangia are freely produced, they are considerably smaller than those described above, but this is not considered as a point of sufficient importance to cause the plant to be regarded as a distinct species.

N. Bonnemaisoni.—Often present, covering large areas; fruiting specimens seen.

N. Gmelini.—Commonly present; fruits rarely found.

N. versicolor.—This rare British species when found often contains filaments which exactly correspond with those of *Endoderma viride*; the fruits have never been observed.

N. laceratum, which is our commonest species of *Nitophyllum*, is rarely, if ever, attacked by *Endoderma*. Occasionally traces of Endoderma-like filaments have been observed, but they bear little resemblance to those of *E. viride*. The place of *Endoderma* on this plant is taken by a species of *Myrionema*, from which it is seldom free. On the older portions of *N. lacertum*, *Myrionema* may often be found in fine fruit.

Delesseria sinuosa.—The older parts of this plant are frequently infected, but not to a great extent. Fruits sometimes present. In *D. sanguinea*, *Endoderma* has not been detected.

STREBLONEMA.

STREBLONEMA INTESTINUM, *Holmes & Batters*, was first described by Reinsch under the name of *Entonema intestinum* (**8**). His specimens were found in *Brongniartella byssoides* at Weymouth, England, some of which are in the Kew Herbarium, named and presented by himself. Reinsch's description is brief and the figures, if compared with his specimens, are very misleading. As neither a good description nor figure exists, and as part of the original specimens are preserved at Kew, it has been thought advisable to redescribe it.

Entonema intestinum was removed to the genus *Streblonema* by Holmes & Batters in the Appendix to British Marine Algæ (**9**. p. 525). The authors do not state their reasons for so doing, neither do they redescribe the plant, the original name is also not mentioned.* Batters, however, in his catalogue of British Marine Algæ (**10**. p. 29) mentions the older name and Reinsch's locality. Apparently the plant has not been recorded since by any investigator.

The following notes are based entirely on Reinsch's preparations.

The thallus is formed of a system of filaments which are found between the cells of the host. There are no signs of external hairs. The filaments branch freely, alternately or irregularly, elongation takes place by apical growth, and bifurcation is not uncommon. The cells of the filaments average 10 μ in thickness and 20 μ in length. In the purely vegetative parts the cells are as a rule longer than in those parts nearer the fructification. The end cells of the short lateral branches are often spherical and enlarged; from the material available the significance of these cells is doubtful. The plurilocular sporangia are produced externally, they are simple and acutely ovate in outline, they measure 50–70 μ long by 20–25 μ long (fig. 5).

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* I have Mr. Holmes's authority for stating that the alteration was based upon the examination of Reinsch's specimens at Kew.

Reinsch's figure (**8.** plate 6. A. fig. 2 *a*) does not by any means illustrate the plant. Indeed the cells of the host-plant figured hardly suggest *B. byssoides* at all. It is fair, however, to Reinsch to state that he adds in a note that his other figures (plate 6) were accidentally destroyed.

The present species differs from *Streblonema parasiticus*, Sauv., which occurs in *Cystoclonium* and *Ceramium*, by the larger sporangia and also by the apparent absence of external filaments. In *S. parasiticus* the later are very conspicuous.

STREBLONEMA ZANARDINII, *De Toni*.—This species was described by Crouan as *Ectocarpus* (section *Streblonema*) *Zanardinii* (**11.** p. 161); it occurs in *Gastroclonium kaliforme*, Ardiss. De Toni (**6.** vol. iii. p. 572) placed it in the genus *Streblonema*.

The following remarks on this species may be of interest as the only information to be obtained as to it, is from the somewhat brief original description.

Very fine material of *S. Zanardinii* was obtained by the author in *Gastroclonium kaliforme* at Weymouth, April 1905. *Gastroclonium* was then in vigorous growth, but although that was the case it was richly infested by the endophyte, indeed the filaments of the latter reached up to the growing apices of the *Gastroclonium*.

The plurilocular sporangia are very freely produced, and are often in pairs; they are usually 50–60 μ in length and 15–20 μ in width. Their general form much resembles that of *S. intestinum*. The short lateral filaments on which they are borne are immersed in the gelatinous sheath of the host, and only the sporangium proper appears externally. In this respect it differs from many species of the genus, but agrees with that last described. A few scattered hair-like filaments protrude here and there, but except for these and the sporangia, the growth is entirely endophytic. Abnormalities are somewhat common in this species,

A.D. Cotton del.
J.N. Fitch lith.
West, Newman imp.

ENDOPHYTIC ALGÆ.

forking of the sporangium being the most frequent. The normal form of sporangium in the genus is simple, and cylindrical or acutely ovate. In some species, however, traces of forking are not uncommon, but in *S. Zanardinii* more or less complete bifurcation frequently occurs.

S. Zanardinii is also found in *Champia parvula.*

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EXPLANATION OF PLATE 12.

Fig. 1. Surface view of a small portion of the frond of *Nitophyllum Hilliæ* infected with *Endoderma viride.* × 200.

2. Section of thallus of *Nitophyllum* showing *Endoderma*-filaments in the outer cell-walls. A filament is also seen growing between the cells towards the other surface of the thallus. × 400.

3. Older portion of *Endoderma* plant, surface view showing sporangia. × 400.

4. Sporangia in various stages. × 400.

5. *Streblonema intestinum.* Drawing from original specimen in *Brongniartella byssoides.* × 250.

6. *Streblonema Zanardinii,* bifurcating sporangium. × 450.

A Second Contribution to the Flora of Africa.—RUBIACEÆ and COMPOSITÆ II. By SPENCER LE M. MOORE, B.Sc., F.L.S.

[Read 5th April, 1906.]

(PLATES **13–15.**)

LIKE those which formed the subject of my first contribution to the African Flora *, the plants described or referred to in the following pages are preserved in the herbarium of the British Museum, and have, of course, been studied there. In addition to Compositæ, the Order to which the first memoir was exclusively devoted, Rubiaceæ have been selected on this occasion, chiefly because the representatives of that Order forming part of a large and important collection recently made by Mr. John Gossweiler in Angola, happening to pass through my hands, cursory examination revealed much of interest among them, and this seemed to promise a solid return for the trouble of elaboration. As a perusal of this memoir will show, many of Mr. Gossweiler's Compositæ have also proved interesting either from novelty or rarity or locality. Plants of the following collectors are also dealt with :—

1. The late Mr. John Buchanan. The 1895 collection is valuable not only for its contents, but because it was sent solely to the British Museum.
2. Mr. Alexander Whyte. This important collection was described by the Museum staff some years ago †, but a few doubtful things remained over. Among these are two Rubiaceæ (***Polysphæria zombensis*** and ***Tricalysia milanjiensis***) and a ***Helichrysum*** (***H. dilucidum***), which are here described.
3. Miss M. S. Henderson, of the Livingstonia Institute. In 1904 this lady presented to the Trustees a small but valuable parcel of specimens from the Nyika Plateau, Nyassaland, and this has yielded a sprinkling of novelties.

In addition, the collections of Mr. G. F. Scott Elliot (Ruwenzori Expedition, 1893–4), Dr. R. F. Rand (Rhodesia, 1897–8), Mr. H. T. Ommanney (Johannesburg District, 1901–2), Mr. F.

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* Journ. Linn. Soc., Bot. xxxv. (1902) pp. 305–367.

† Trans. Linn. Soc. ser. II. Bot. vol. iv. (1894) pp. 1–67.

Eyles (Rhodesia, 1904), Mr. J. Burtt Davy (Transvaal and Swaziland, 1905), and Mr. E. R. Sawer (South Rhodesia, 1905) are treated incidentally, as also are those of Pogge (Angola), Zenker (Cameroons), and a few others.

Reference will also be found to three little-known Composite plants. One of these is *Dicoma radiata*, Less., a species interesting as the sole member of section *Rhigiothamnus*; this being unrepresented at Kew, was not examined by Bentham while studying the Compositæ for the 'Genera Plantarum.' The two others are old specimens from the Leipzig Garden, forming part of the Auerswald Herbarium acquired by the Trustees in 1871. One may remark, with regard to these three, that the number of old types to be seen in this country at the British Museum alone is surprisingly large; a fact which, were it kept more constantly in mind, would be of advantage to botanists commensurably with the handicapping that forgetfulness or ignorance of it has entailed in the past.

RUBIACEÆ.

PENTACARPÆA ARENARIA, *Hiern, in Cat. Welw. Pl.* i. 439.
On the road to Quepacaca, near Malange; *Gossweiler*, 1234.
"Corolla-tube purplish violet, limb beautifully dark violet."

OTOMERIA LEPTOCARPA, sp. nov. Herba perennis, inferne lignescens, ramulis patulis gracilibus crebro foliosis puberulis novellis crispe pubescentibus, foliis ovato-lanceolatis lanceolatisve acutis vel breviter acuminatis basin versus in petiolum brevem sensim angustatis in nervis minute pubescentibus puberulisve ceterum glabris membranaceis læte viridibus, stipulis abbreviatis setis 5 sat elongatis omnimodo filiformibus hispidulis onustis, spicis cito elongatis ac revera folia magnopere excedentibus crispe puberulis, floribus geminis pro rata parvis, calycis pubescentis tubo (ovario) turbinato limbo 4-lobo, lobo dilatato lineari-lanceolato obtusiusculo lobis aliis subulatis his quam calyx brevioribus illo multo longiore, corollæ tubo superne gradatim ampliato ibique extus pubescente lobis 5 simpliciter valvatis oblongis obtusis tubo multo brevioribus, filamentis antheris breviter exsertis æquilongis, stylo incluso glabro, ramis brevibus anguste linearibus, capsula cylindrica puberula loborum reliquiis coronata.

Hab. Loanda, Cazengo, on stony hills above Palmyra; *Gossweiler*, 646.

Planta 30·0 cm. alt. vel etiam altior. Folia modice 3·0–4·0 cm. long., 1·0–2·0 cm. lat.; costæ secundariæ utrinque 5, ascendentes, vix arcuatæ; petioli 0·3–0·5 cm. long. Stipularum limbus 0·13 cm., setæ 0·3–0·5 cm. long. Flores albi. Calycis tubus 0·2 cm., lobi minores inter se inæquales, 0·1–0·15 cm., lobus maximus 0·8–1·0 cm. long. Corollæ tubus 1·2 cm., inferne (exsiccata) 0·02 cm. diam., sub limbo 0·08 cm., humectata vero fere 0·2 cm.; lobi humectati 0·25 cm. long., extus pubescentes. Filamenta glabra, fusca, ut antheræ oblongæ 0·15 cm. long. Stylus 0·35 cm., rami 0·05 cm. long. Capsula sicca 0·4 cm. long., 0·15 cm. lat.

Nearest *Otomeria lanceolata*, Hiern, which is glabrous or almost so, has narrower leaves, different stipules and calyx, broader glabrous capsules, &c.

OTOMERIA RUPESTRIS, *Hiern*, *in Journ. Bot.* xxxvii. (1900) 58. Berbera; *G. W. Bury*.

OLDENLANDIA STENOSIPHON, *K. Schum. MSS.* Herba annua, caule tenui ascendente simplici vel subsimplici paucifolioso subtereti scabriusculo, foliis sessilibus anguste linearibus obtuse acutis basin versus paullulum angustatis uninervibus utrinque scabriusculis, stipulis vaginantibus integris sursum setaceo-acuminatis extus scabriusculis, cymis terminalibus laxiuscule pauci- vel plurifloris quam folia multo longioribus, floribus mediocribus sæpissime brevissime pedicellatis tetrameris, calycis tubo (ovario) ovoideo hispidule scabrido limbi alte partiti lobis subulatis tubum æquantibus, corollæ sursum puberulæ tubo elongato tenuissimo sub limbo subito dilatato limbi lobis brevibus oblongis obtusis, staminibus inclusis, stylo a corollæ tubo longe superato, ramis anguste linearibus puberulis, capsula vertice dehiscente subglobosa (utrinque paullulum depressa) crustaceo-membranacea scabriuscula.

Hab. Loanda, in pastures at Pentico and Mario do Cruz; *Gossweiler*, 154 & 1550. Malange; *Pogge*, 396.

Planta 20·0–30·0 cm. alt. Radix brevis, debilis, paucifibrillosus. Folia 1·5–3·5 cm. long., 0·2–0·3 cm. lat. Stipulæ petiolo adnatæ, 0·2–0·3 cm. long., decolores. Cymæ nunc 8·0 cm. vel etiam minus, nunc 20·0 cm. long., scabriusculæ. Bracteæ subulatosetaceæ, circa 0·2 cm. long. Pedicelli modici 0·1–0·2 cm. long., rarissime adusque 0·7 cm. Calyx totus (florescens) 0·2 cm. long., fructescens 0·3×0·33 cm., dentes intermedii 0. Flores albi. Corolla tota humectata 1·2–1·5 cm. long.; tubi pars angusta 0·6–0·9×0·04 cm.; pars dilatata 0·15–0·2×0·1 cm.; lobi 0·3–0·35 cm. long. Antheræ sessiles, oblongæ, 0·12 cm. long. Stylus 0·55 cm., rami hujus 0·1 cm. long. Semina numerosa, minuta, angulata, levia.

Near *Oldenlandia Schimperi*, T. And., but more slender in habit and with different calyx, corolla, and fruit.

The Pentico plant (no. 154), which was found growing in "poor pastures," is a dwarf in every respect similar to Pogge's, of which a scrap at Kew is the only representative in this country. I cannot find that the late lamented K. Schumann ever published a description of this latter.

JUSTENIA ORTHOPETALA, *Hiern, Cat. Welw. Pl.* i. 452.
Angola, Cazengo: *Gossweiler*, 611.

MUSSÆNDA ARCUATA, *Poir., in Lam. Encycl.* iv. 392; var. PARVIFLORA, var. nov. Corolla tota 1·8 cm. long., lobi rotundati modo 0·5 cm. long.

In wet situations along the flat banks of the Quizanga near Malange; *Gossweiler*, 1235.

M. LUTEOLA, *Del. Cent. Pl. Méroé*, 65.
Angola, Cazengo; *Gossweiler*, 563.

HEINSIA LINDENIOIDES, sp. nov. Verisimiliter fruticulus, ramulis abbreviatis bene foliosis crispe pubescentibus cito glabris et foliorum delapsorum basibus persistentibus onustis, foliis parvis sessilibus ovatis obtusis vel obtusissimis basi obtusis utrinque sparsim pubescentibus in sicco griseis, stipulis e basi lata nuda vel glandulis perpaucis induta integris vel oblongo-lanceolatis vel bifidis vel alte bipartitis segmentis setaceis pubescentibus, floribus solitariis terminalibus, calycis griseo-pubescentis lobis 6 linearibus obtuse acutis, corollæ verisimiliter albæ tubo attenuato elongato paullo infra fauces leviter dilatato extus puberulo lobis 6 oblanceolatis acutis patentibus, staminibus paullo infra fauces insertis, antheris inclusis, ovario 2-loculari calyce fere æquilongo, stylo exserto, stigmatis lobis oblongis crassis.

Hab. Nyika Plateau, Nyassaland; *Miss Henderson.*

Folia membranacea, 1·5–2·5 cm. long., 1·0–1·3 cm. lat.; costæ secundariæ utrinque 6, deorsum apertissime arcuatæ sursum arrectæ. Stipulæ 0·2–0·35 cm. long. Calycis lobi inter se paullulum inæquilongi, 0·65–0·8 cm. long., circa 0·1 cm. lat. Corollæ tubus 10·0–11·0 cm. long., 0·3 cm. sub faucibus 0·4 cm. diam.; lobi vix 2·0 cm. long., summum 0·5–0·6 cm. lat. Stamina ad 2·0 cm. infra os affixa; filamenta 0·3 cm. long., glabra; antheræ lineares, apice apiculatæ, 0·9 cm. long. Ovarium 0·5 cm. long., pubescens. Stylus 12·0 cm. long., pubescens. Stigmatis humectati lobi 0·3 × 0·13 cm. Fructus non vidi.

A remarkable plant recognised easily by its small greyish leaves, long and slender corolla-tube, and stamens inserted a short way below instead of in the throat.

TARENNA CONGENSIS, *Hiern, in Fl. Trop. Afr.* iii. 91.
Loanda, Cazengo; *Gossweiler*, 643.

T. FLAVO-FUSCA, *S. Moore* (Chomelia flavo-fusca, *K. Schum.*, *in Engl. Bot. Jahrb.* xxxiii. (1903) 339).
Loanda, Cazengo; *Gossweiler*, 682.
Hitherto known only from the Cameroons.

TARENNA PATENS, sp. nov. Verisimiliter fruticosa, glabra, ramulis teretibus distanter foliosis, foliis ellipticis obtusis basi in petiolum brevem angustatis tenuiter coriaceis in sicco fuscescentibus fac. sup. subnitidis subtus pallidioribus, stipulis brevibus connatis sursum acuminatis, floribus mediocribus in corymbis laxis plurifloris ramulos terminantibus dispositis, bracteis parvulis subulatis, pedunculis elongatis attenuatis quam calyx multo longioribus, calycis tubo (ovario) subsphæroideo limbo brevissime 5-fido (sc. fere truncato) æquilongo, corollæ hypocraterimorphæ tubo gracillimo sursum leviter dilatato quam lobi lineari-oblongi obtusi breviore faucibus villosis, filamentis abbreviatis antheris leviter exsertis, stylo longe exserto in medio villosulo superne incrassato, stigmate anguste fusiformi.

Hab. Loanda, Cazengo; *Gossweiler*, 488.

Folia 6·0–10·0 cm. long., 2·5–5·0 cm. lat.; costæ secundariæ utrinque 6–7, levissime arcuata, utrobique perspicuæ; petioli 0·6–1·0 cm. long., superne canaliculati. Corymbi 9·0–12·0 cm. diam., ejus rami sæpe patentissimi, gracillimi. Bracteæ 0·1–0·2 cm. long. Pedicelli sæpissime 0·7–1·5 cm. long. Calycis tubus

0·12×0·14 cm., limbus 0·15 cm. long. Corollæ tubus 0·6 cm. long., basi 0·12 cm., faucibus 0·2 cm. lat.; lobi 1·0 cm. long., 0·25 cm. lat. Filamenta 0·12 cm., antheræ 1·1 cm. long. Ovula in loculis pluria. Stylus 1·5 cm., stigma 0·4 cm. long.

Somewhat like *T. flavo-fusca* in appearance, but the leaves are without the broad cusps of that species, the inflorescences are less lax, the pedicels shorter, the corolla-tube is shorter and has longer lobes, &c.

TARENNA GOSSWEILERI, sp. nov. Fruticosa, a basi ramosa, ramulis subteretibus pubescentibus, foliis brevipetiolatis oblongo-ovatis breviter cuspidatis apice obtusis basi aliquanto rotundatis supra mox appresse piloso-puberulis dein glabris subtus præsertim secus nervos piloso-pubescentibus, stipulis inter se liberis parvis a basi lata triangularibus acuminatis extus fere glabris, corymbis terminalibus densifloris subsessilibus breviterve pedunculatis dense subfulvo-pubescentibus, bracteis oblongis vel linearibus quam calyx sæpissime brevioribus, calycis strigosi tubo (ovario) turbinato limbo alte 5-partito subæquilongo limbi lobis lanceolatis obtusis, corollæ hypocraterimorphæ tubo elongato attenuato extus sparsim puberulo faucibus villosulis lobis oblongis obtusis quam tubus brevioribus, filamentis brevibus antheris breviter exsertis, stylo longe exserto in medio villosulo, stigmate anguste fusiformi crassiusculo.

Hab. A rather rare shrub on the left bank of the river Quije, near Quizol; *Gossweiler*, 1258.

Fere orgyalis. Foliorum limbus 7·0–9·0 cm. × 3·0–4·0 cm., subcoriaceus, in sicco brunneus; costæ secundariæ utrinque 7–9, ascendenti-patulæ, pag. inf. eminentes, summæ fere evanidæ; petioli circa 0·5 cm. long. Stipulæ 0·3 cm. long. Corymbi 3·5 cm. diam. Bracteæ modice 0·2–0·3 cm. long., rarissime 1·0 cm. Calycis tubus 0·25 cm., lobi 0·3 cm. long. Corolla alba et monente cl. detectori suaveolens; tubus 2·0 cm. long., 0·15 cm. diam.; lobi 0·75 cm. × 0·3 cm. Filamenta 0·12 cm. long., antheræ 0·7 cm. Ovula in loculis pluria. Stylus 2·8 cm., stigma 0·6 cm. long.

Looks very much like *T. conferta*, Hiern, var. *macrantha*, K. Schum., but is more hairy, with leaves rounded at base (not acute), more strongly hairy calyx, longer corolla with a narrower tube, &c.

Randia micrantha, *K. Schum., in Engl. Jahrb.* xxiii. (1896) 438; var. Poggeana, *K. Schum.* (e descript.).

Loanda, Cazengo, in dense forest at Monte Bello and foot of Monte Lau; *Gossweiler*, 711 & 711 B.

Leaves somewhat smaller than those of the specimens described, viz. 8·0–10·0 cm. × 3·0–4·5 cm., but otherwise agreeing with the description.

Var. Zenkeri, var. nov. A var. præcedenti distat ob corollæ lobos extus glabros.

Cameroons, Bipinde; *Zenker*, 3173.

Randia castaneofulva, sp. nov. Fruticosa, verisimiliter scandens, inermis, ramulis teretibus pube densa castaneo-fulva indutis dein glabrescentibus, novellis ipsis tomentosis, foliis amplis ellipticis obtusis vel obtusissimis in petiolum brevem cuneatim angustatis subcoriaceis pag. sup. cito appresse piloso-puberulis pag. inf. præsertim in nervis castaneo-pubescentibus, stipulis mox dehiscentibus triangulari-ovatis acuminatis extus appresse pubescentibus intus ima basi villosis ceteroquin glabris necnon castaneis, corymbis axillaribus abbreviatis paucifloris ut bracteæ pedicelli ovarium et calyx dense castaneo-fulvo-pubescentibus, bacteis parvis ovatis juxta medium pedicellum sæpe insertis, pedicellis validis ovarium subæquantibus, calycis tubo (ovario) cylindrico-turbinato quam limbus anguste campanulatus breviter 5-lobus breviore, lobis late triangularibus obtusis acutisve, corollæ mediocris tubo calycis limbum paullulum superante lato extus deorsum glabro sursum villoso intus præter fauces annulatim villosas glabro lobis tubo duplo brevioribus oblongo-ovatis obtusis extus dense fulvo-villosis, antheris sessilibus ore insertis subinclusis, ovario 2-loculari, stylo incluso glabro, stigmate clavato breviter bilobo longitrorsum sulcato, ovulis numerosissimis, bacca nondum matura anguste ellipsoidea longitrorsum sulcata pubescente calyce persistente coronata.

Hab. Loanda, Cazengo; *Gossweiler*, 621.

Folia 10·0–13·0 cm. × 5·5–7·5 cm.; costæ secundariæ utrinque circa 10, faciebus ambabus perspicuæ inferiori eminentes; petioli 0·7–1·2 cm. long., castaneo-pubescentes. Stipulæ paullo ultra 1·0 cm. long. Corymbi 2·0–3·0 cm. long. Bracteæ 0·3–0·6 cm., pedicelli 0·5 cm., ovarium 0·5 cm., calycis limbus totus 0·9 cm. et lobi 0·4 cm. long. Flores albi. Corolla tota 1·8 cm. long.

tubus 1·2 cm., lobi 0·6 cm. long., ille basi 0·4 cm. faucibus 0·6 cm. diam. Antheræ 0·45 cm. long. Stylus 1·1 cm. long., infra medium incrassatus; stigma 0·45 cm. long. Bacca adusque 2·3 cm. × 1·3 cm.

To be inserted next *Randia penduliflora*, K. Schum., but with densely pubescent young branches, smaller leaves pubescent below, shorter lobes to the calyx, smaller corollas with the tube very shortly exceeding the calyx and easily distinguishable from it.

Mr. Gossweiler notes that the fruit is much like that of the Guava.

MORELIA SENEGALENSIS, *A. Rich., ex DC. Prod.* iv. 617.

Angola, in humid situations on the banks of the river Quije near Quizol; *Gossweiler*, 618 & 1259.

TRICALYSIA GOSSWEILERI, sp. nov. Glabra, ramulis gracilibus subteretibus crebro foliosis, foliis brevipetiolatis ovatis cuspidatis apice obtusis basi cuneatis papyraceis costis secundariis distantibus utrinque 5 summis sæpe parum perspicuis, stipulis a basi lata subito in acumen breve productis, cymis subsessilibus paucifloris, calyculo alte bilobo fere omnino glabro, calycis tubo (ovario) subgloboso obscure puberulo quam limbus campanulatus 5-fidus haud longiore lobis brevibus obtusis, corolla mediocri calycem longe excedente extus glabra 5-loba, lobis tubo paullo brevioribus ovato-oblongis obtusis faucibus villosis, antheris corollæ lobis paullo brevioribus longe apiculatis, stylo breviter exserto ramis sat longis lineari-spathulatis prædito, ovulis quove in loculo 2 placenta carnosa immersis.

Hab. Loanda, Cazengo; *Gossweiler*, 688.

Folia solemniter 8·0–10·0 cm. long., 3·5–5·0 cm. lat., supra nitidula necnon in sicco viridi-brunnescentia subtus viridia; petioli 0·5–0·7 cm. long., in sicco transversim rugulosi. Stipulæ 0·4 cm. long. Cymæ circiter 10-floræ. Calyculus 0·15 cm. long. Ovarium 0·1 cm., calycis limbus totus 0·12 cm., lobi 0·04 cm. long. Corolla tota 0·75 cm., tubus 0·4 cm., lobi 0·35 cm., antheræ 0·3 cm. long. Stylus 0·5 cm., rami fere 0·2 cm. long.

Near *T. oligoneura*, K. Schum., a Cameroons plant, but with smaller leaves, shorter and relatively broader calyx with very short blunt teeth, smaller corolla with obtuse lobes, and strongly apiculate anthers.

TRICALYSIA GRISEIFLORA, *K. Schum., in Engl. Jahrb.* xxiii. (1896) 446.

Angola, common in thickets and bushy grass-lands about Malange; *Gossweiler*, 1245 & 1250.

PENTANISIA RHODESIANA, *S. Moore, in Journ. Bot.* xl. (1902) 252.

South Rhodesia, Penhalonga at 6000 feet; *E. R. Sawer.*

POLYSPHÆRIA ZOMBENSIS, sp. nov. (Plate **13.**) Verisimiliter fruticosa, ramis gracilibus tetragonis glabris novellis puberulis, foliis breviter petiolatis ovato-lanceolatis breviter cuspidatis obtusis basi rotundatis vel rotundato-truncatis tenuissime coriaceis utrinque glabris in sicco fuscescentibus, stipulis deltoideo-ovatis acuminatis extus diuscule appresse puberulis, glomerulis 3–10-floris pedunculis glabris recurvis suffultis, bracteolis communibus necnon calyculi phyllis ovatis acutis vel obtusis his equidem sæpe truncatis ut calyx margine obscure undulatus extus et intus minutissime sericeis, corolla tubuloso-campanulata quam calyx multo longiore extus puberula faucibus villosis lobis ovatis obtusis tubo brevioribus, antheris subinclusis, fructu ——.

Hab. Nyassaland, Zomba; *A. Whyte.*

Foliorum limbus raro 12·0 cm. attingens, solemniter 6·0–9·0 cm. long., juxta medium 3·0–5·0 cm. lat.; costæ secundariæ utrinque circa 12, horizontales vel ascendentes, marginem versus subito arcuatæ; nervulæ aperte reticulatæ, delicatulæ; petioli circiter 0·5 cm. long., supra late canaliculati. Pedunculi profecto evoluti (sc. sub floribus jam pansis) 1·0 cm. long. Stipulæ 0·4–0·5 cm. long. Bracteolæ calyculique phylla 0·15–0·2 cm. long. Calycis tubus (ovarium) late turbinatus, ut limbus 1·0 cm. long. Corolla tota 0·5 cm. long., basi 0·1 cm. faucibus 0·25 cm. lat.; lobi 0·2 cm. long. Antheræ 0·25 cm. long. Stylus inferne glaber superne dense apicem versus minute pubescens, 0·7 cm., rami complanati vix 0·1 cm. long.

An interesting plant, as its nearest congeners are the recently described *P. pedunculata,* K. Schum. (in De Wildem. Fl. Katanga, 226), and *P. arbuscula,* K. Schum. (in Engl. Bot. Jahrb. xxxiii. (1903) 349), which, like it, differ from all other known species by reason of the stalked inflorescences. *P. arbuscula*, of which I have seen no specimen, is described as a tree with leaves acute at the petiolar end, smaller stipules (0·1–0·15 cm. long), peduncles only half the length, bracteoles villous inside, and a

smaller calyx. *P. pedunculata*, among other points of difference, also has leaves acute at the base.

The genus divides up naturally into two sections—one comprising species with sessile glomerules, which I propose to call § *Ephedranthæ*, the other to include the three plants noticed above, which may be placed in a § *Cladanthæ*.

CANTHIUM LOANDENSE, sp. nov. Frutex, verisimiliter erectus, ramis rigidis efoliatis cortice albido circumdatis ramulos breves foliosos patentes emittente, foliis parvis oblongo-obovatis obtusissimis deorsum in petiolum brevem sensim coarctatis subcoriaceis supra puberulis dein glabrescentibus subtus griseo-pubescentibus, stipulis basi late triangularibus sursum attenuatis diu persistentibus extus pubescentibus, floribus parvis in paniculis axillaribus plurifloris abbreviatis villosulo-pubescentibus digestis, bracteis lanceolatis quam pedicelli multo brevioribus, pedicellis calycem longe excedentibus patentibus ut calyx villosulo-pubescentibus, calycis parvuli tubo (ovario) turbinato limbo usque ad $\frac{1}{3}$ 5-lobo lobis triangularibus acutis, corollæ tubo calycem bene superante infundibuliformi, faucibus pilosulis lobis 3 late oblongis obtusis tubo paullo brevioribus, staminibus 3 ore insertis, filamentis abbreviatis, antheris oblongis apice acutis breviterve acuminatis, disco glabro, stylo breviter exserto superne obscure puberulo, stigmate oblongo, bacca sphæroidea puberula abortu 1-loculari.

Hab. Loanda, without further indication of locality; *Gossweiler*, 145 & 414.

Folia 3·5–4·0 cm. × 1·5–2·5 cm., supra in sicco olivaceo-fusca necnon subnitida subtus olivaceo-grisea; costæ secundariæ utrinque 7–9, supra impressæ subtus magis perspicuæ. Stipulæ 0·3 cm. long., mox induratæ. Paniculæ modo 1·0–1·5 cm. long., et circa totidem diam. Ovarium 0·1 cm., calycis limbus totus 0·15 cm., lobi 0·05 cm. long. Pedunculus 0·2–0·3 cm., pedicelli 0·3 cm. long.; bracteæ circiter 0·1 cm. long. Corollæ tubus 0·5 cm. long., basi 0·1 cm., faucibus 0·15 cm. lat.; lobi 0·4 cm. long. Filamenta 0·06 cm., antheræ 0·35–0·4 cm. long. Stylus 0·6 cm., stigma 0·2 cm. long. Bacca 0·5–0·6 cm. diam., nigra, nitidula.

Distinguished by the small leaves with grey pubescence on the lower side, the very short panicles, the small villosulous-pubescent pedicels and calyces, &c. The trimerous corolla and andrœcium are peculiar; possibly this is not a constant feature of the species.

CANTHIUM ABBREVIATUM, *S. Moore* (Plectronia abbreviata, *K. Schum., in Engl. Jahrb.* xxviii. (1899) 73).

In thickets near Malange after the queimados (forest fires).

Flowers greenish white; lobes of limb spreading and reflexed at time of flowering.

C. LANCIFLORUM, *Hiern, in Fl. Trop. Afr.* iii. 146.

Angola, Malange, in thickets always in colonies of about half-a-dozen specimens; *Gossweiler*, 1238 & 1238 B.

A tree 20 feet high; leafless at time of flowering. Flowers in July; young fruits in August.

CANTHIUM OPIMUM, sp. nov. Frutex humanæ altitudinis vel altior, ramis validis obscure applanatis cortice cinereo denso obductis, foliis amplis petiolatis ovatis vel ovato-oblongis leviter cuspidatis obtusis basi cuneatim angustatis sæpe obliquis margine leviter undulatis vel aliquantulum undulato-crenulatis utrobique glabris, stipulis deorsum late triangularibus in partem attenuatam longam angustatis intus villosis diuscule persistentibus, floribus mediocribus in paniculis pedunculatis axillaribus multifloris quam folia brevioribus dispositis, bracteis linearibus quam pedicelli puberuli sæpissime brevioribus, calycis tubo (ovario) late turbinato obscure puberulo limbo tubum paullo excedente 5- (raro 4-)dentato glabro, corollæ extus glabræ tubo calycem bene excedente infundibuliformi faucibus dense villosis lobis 5 (raro 6) lineari-lanceolatis obtusiusculis tubum æquantibus, staminibus ore insertis, antheris subsessilibus anguste ovato-oblongis brevissime apiculatis, disco glabro, stylo breviter exserto glabro, stigmate mitriformi apice bifido longitrorsum sulcato.

Hab. Angola, Kahalla near Malange; *Gossweiler*, 1239.

Planta "5–8-ped." alta sec. cl. detectorem. Rami 0·7–0·8 cm. diam. Folia 10·0–20·0 cm. long., 6·0–7·5 cm. lat., in sicco supra olivaceo-fusca subtus viridia; costæ secundariæ 7, apertissime arcuatæ, satis pingues, ut costulæ laxe reticulatæ utrinque perspicuæ; petioli crassiusculi, 1·5 cm. long. Stipulæ 0·7 cm. long. Paniculæ ter dichotomæ, 3·0–4·0 cm. long., 3·0 cm. diam. Bracteæ modice 0·2–0·3 cm. long., ultimæ 0·1–0·15 cm. Pedicelli raro 0·65 cm., solemniter 0·2–0·4 cm. long. Calycis tubus

0·13 cm., limbus 0·18 cm. long. Corollæ virescentis tubus 0·4 cm. long.; lobi reflexi, basi fere 0·15 cm. lat. Antheræ 0·15 cm. long. Stylus 0·5 cm., stigma 0·2 cm. long., hoc vivum viride.

Known by the large glabrous leaves cuneate at base, together with the short axillary panicles, small ovary, dentate calyx, &c.

Mr. Gossweiler notes that the thick corky "bark" protects the plant from the injurious effects of bush-fires.

VANGUERIA RANDII, *S. Moore, in Journ. Bot.* xl. (1902) 252.

Matopo Hills, Rhodesia; *F. Eyles*, 1191.

FADOGIA STENOPHYLLA, *Welw., ex Hiern, in Fl. Trop. Afr.* iii. 155.

Angola, in shrubby pastures near Loba Quatunga; *Gossweiler*, 1244.

PAVETTA PHILLIPSIÆ, *S. Moore, in Journ. Bot.* xxxvii. (1899) 369.

Berbera; *G. W. Bury*.

RUTIDEA HIRSUTA, *Hiern, Cat. Welw. Pl.* i. 491.

Loanda, Cazengo; *Gossweiler*, 633.

R. FERRUGINEA, *Hiern, in Fl. Trop. Afr.* iii. 189.

Loanda, Cazengo, in densest thickets on high ground (2500 feet) near Monte Bello; *Gossweiler*, 665.

Flowers white, scented. Fruit yellowish green with wine-red seeds. An Upper Guinea plant.

PSYCHOTRIA CRISTATA, *Hiern, in Fl. Trop. Afr.* iii. 205.

Loanda, Cazengo; *Gossweiler*, 628

GEOPHILA AFZELII, *Hiern, Fl. Trop. Afr.* iii. 221.

Loanda, Cazengo; *Gossweiler*, 770.

ANCYLANTHOS FULGIDUS, *Welw., ex Hiern, in Fl. Trop. Afr.* iii. 159.

Malange, in chalky soil near Quizanga; *Gossweiler*, 1236.

CRATERISPERMUM LAURINUM, *Benth., in Hook. Niger Fl.* 411.

N'Bango, near Malange; *Gossweiler*, 1253.

Everywhere plentiful in primary thickets. Seems to suffer less than any other shrub from fire. Recommended for green fences on account of the density of its palings and easy culture.

Diodia stipulosa, sp. nov.; ramis puberulis in sicco alte sulcatis, foliis breviter petiolatis ovatis apice cuspidato-acutis basi obtusis margine minute ciliolatis eleganter costatis nervis utrinque 3–4 ex costæ mediæ dimidio proximali ortis firme membranaceis præcipue fac. sup. scabriusculis, stipulis magnis deorsum latissimis sursum longisetosis, calycis lobis 4 sat elongatis subulato-linearibus quam ovarium paullulum longioribus ciliolatis, corollæ tubo calycem bene excedente superne gradatim expanso limbi, lobis 4 oblongis tubo multo brevioribus, ovario 2-loculari, stylo exserto, stigmate breviter 2-lobo, fructibus e coccis duobus crustaceis puberulis sistentibus.

Hab. East Africa: Kikuyu; *Dr. J. W. Gregory*, 92. Sani; *Kässner*, 753. Marangu; *Volkens*, 413.

West Africa: Cameroons; *Preuss*, 682. (Also, at Kew, *H. H. Johnston*, 97.)

Folia ± 4·0 × 2·0 cm. Stipulæ brunneo-stramineæ 0·7–0·8 cm. lat.; harum pars indivisa circa 0·5 cm., setæ adusque 0·8 cm. long. Calycis lobi fere 0·4 cm. long., 0·03 cm. lat. Corollæ tubus 0·7 cm. long., basi 0·04 cm. faucibus 0·2 cm. diam.; lobi 0·3 cm. long., infra apicem barbellati. Antheræ exsertæ, 0·12 cm. long. Ovarium 0·3 cm., stylus glaber, 1·5 cm. long. Stigmatis lobi 0·05 cm. long., papillosi. Fructus cocci ægre 0·5 cm. long. Semina 0·4 cm. long., vix 0·1 cm. lat., pallide nitentia.

Confused hitherto with *D. breviseta*, Benth., and *D. sarmentosa*, Sw., from which it can be distinguished at a glance by means of the large loose stipules with long setæ. The flowers also prove on examination to be different in several respects, and the fruits and seeds of *D. stipulosa* are considerably larger.

Diodia angolensis, sp. nov. Herba, verisimiliter perennis, decumbens, rigida, ramis validis crebro foliosis quadrangularibus subsparsim hispidule pubescentibus, foliis sessilibus anguste lineari-lanceolatis apice breviter spinosis scabride hispidulis uninervibus coriaceis in sicco pallide brunneo-viridibus, stipulis abbreviatis truncatis apice setis 5–7 elongatis onustis, floribus in axillis sæpissime solitariis, calycis lobis 4 alternis brevioribus lineari-lanceolatis acutis setuloso-ciliatis ovario setuloso subæquilongis, corollæ extus puberulæ tubo calycem longe superante faucibus ampliatis lobis 4 ovatis obtusis quam tubus brevioribus, ovario 2-loculari, stylo breviter exserto puberulo, stigmate

capitato-bilobo, fructu dicocco coccis obovoideis tricostatis superne breviter setulosis.

Hab. Loanda, without specific locality; *Gossweiler*, 364.

Folia solemniter 1·5–2·0 cm. long., 0·2–0·4 cm. lat., in sicco plus minus revoluta; costa media fac. inf. maxime eminens, decolor, pilis brevibus hispidis munita. Stipularum limbus 0·15 cm. long., extus breviter setulosus; setæ hujus inter se inæquales, 0·3–0·5 cm. long. Calycis lobi 0·17–0·2 cm. long. Corollæ humectatæ tubus 0·8 cm. long., prope basin 0·15 cm., faucibus 0·3 cm. diam.; limbi lobi 0·4 cm. long. Filamenta 0·12 cm., antheræ 0·25 cm. long. Ovarium turbinatum, 0·2 cm., stylus 1·2 cm. long.; stigma 0·06 cm. diam. Cocci exsiccati 0·3 cm. long., ima basi 0·1 cm., apice 0·2 cm. lat., brunnea, superne costulis transversis paucibus percursi.

Known by the rigid, brown-green, spine-tipped, more or less revolute leaves, the usually solitary flowers, large corollas, setulose ovaries, and small cocci.

COMPOSITÆ, II.

ERLANGEA CENTAUROIDES, *S. Moore, in Journ. Linn. Soc., Bot.* xxxv. (1902) 313.

Berbera; *G. W. Bury.*

VERNONIA VIOLACEA, *Oliver & Hiern, in Fl. Trop. Afr.* iii. 275.

Saba Catunga near Malange; *Gossweiler*, 1159.

A Nile-Land species.

V. DEKINDTII, *O. Hoffm., in Bol. Soc. Brot.* xiii. (1896) 19.

Cazengo; *Gossweiler, sine no.*

V. POLYSPHÆRA, *Baker, in Kew Bull.* (1898) 148.

N'Golo near Malange; *Gossweiler*, 1169.

A Nyassaland plant now first announced from the Lower-Guinea region.

V. SCULPTIFOLIA, *Hiern, Cat. Welw. Pl.* i. 523.

Cazengo, among grasses on Monte Lau; *Gossweiler*, 686.

V. PHYLLODES, *Hiern, Cat. Welw. Pl.* i. 525.

Right bank of river Quanze near Malange; *Gossweiler*, 1176.

Vernonia (§ *Decaneuron*) **Gossweileri**, sp. nov.; caule robusto brevissimo e rhizomate brevi necnon crasso fibras longas rigidas emittente oriundo et una cum eodem sordide sericeo-villoso, foliis congestis oblongo-obovatis apice rotundatis mucronulatisque deorsum longe ac sensim angustatis basi breviter vaginantibus margine calloso-denticulatis vel mere undulatis utrinque mox fere glabris membranaceis in sicco viridibus, capitulis mediocribus multiflosculosis solitariis scaposis, scapis folia excedentibus puberulis sub capitulo griseo-pubescentibus bracteis paucis lineari-subulatis onustis, involucri subhemisphærici scabride pubescentis phyllis 5-serialibus lineari-lanceolatis acuminatis exterioribus quam interiora multo brevioribus viridibus (præsertim apicem versus) intimis membranaceis, flosculis exsertis, achæniis cylindricis 10-costatis sericeis quam pappus pluriserialis stramineus multo brevioribus.

Hab. Angola, Malange in Parinari and U'Gambo groves; *Gossweiler*, 1167.

Folia modica 9·0–10·0 cm. × 1·5–2·5 cm. (rarissime 12·0 × 3·5 cm.), glandulis immersis prædita; costa centralis crassus, utrinque bene aspectabilis, costæ reliquæ parum perspicuæ, folia vero vetusta optime reticulato-nervosa. Scapus adusque 22·0 cm. alt., ascendens; hujus bracteæ distantes, ± 0·5 cm. long., pubescentes. Capitula pansa 3·0 cm. diam. Involucri phylla extima 0·5–0·6 cm., interiora ± 1·5 cm., intima 2·0 cm. long. Corollæ violaceo-cæruleæ; tubus cylindricus 1·5 cm. long., deorsum 0·06 cm., sursum 0·1 cm. diam.; lobi vix 0·5 cm. long. Styli rami 0·5 cm. long. Achænia 0·4–0·5 cm. × 0·08–0·12 cm.; pappi setæ inter se inæqualia, longiora 1·0 cm. long., pauca breviora externa 0·1–1·0 cm.

Near *V. gerberiformis*, Oliver & Hiern, which has somewhat different heads, there being fewer rows of broader and acute, not acuminate, involucral leaves, &c.

V. chthonocephala, *O. Hoffm., in Bol. Soc. Brot.* xiii. (1896) 17.

Loanda, on top of the M'Bango Mountain; *Gossweiler*, 1152. Flowering after fire has destroyed all the surrounding dry grass.

Vernonia (§ *Stengelia*) **rotundisquama**, sp. nov.; caule e rhizomate oriundo ascendente superne breviter rariramoso valido griseo-tomentoso demum pubescente, foliis sessilibus anguste oblongo-obovatis obtusis basi parum attenuatis necnon rotundatis margine crenato-serratis coriaceis supra scaberrimis subtus griseo-tomentosis, capitulis mediocribus multiflosculosis ex apice ramulorum 2–3-ternatim ortis, pedunculis propriis nunc abbreviatis nunc capitula æquantibus excedentibusve griseo-tomentosis superne bracteis late spathulatis tomentosis crebro onustis, involucri hemisphærici saltem 8-serialis phyllis inter se parum inæqualibus late oblongis crustaceis lamina brevi rotundato-ovata apiculata scariosa reticulato-nervosa purpurascente in sicco reflexa humectata vero ascendenti-patente coronatis, flosculis exsertis, corollarum tubo inferne tenuissimo superne late dilatato, achæniis parvis subcylindricis (basin versus levissime coarctatis) 10-costatis fulvo-sericeis, pappi straminei setis pauciseriatis complanatis ciliolato-barbellatis exterioribus quam interiora manifeste brevioribus.

Hab. Angola, Quamanhianga near Malange; *Gossweiler*, 1228.

Perennis et fere $\frac{2}{3}$-metralis. Caulis eleganter sulcatus, circa 0·5 cm. diam. Folia adusque 7·5 × 3·0 cm., sæpius vero circa 3·0–4·0 × 1·5–2·0 cm. Pedunculi proprii 0·5–3·0 cm. long. Capitula 2·0–2·5 cm. diam.; horum bracteæ 0·6–0·9 cm. long. Involucri phylla extima 0·8 cm., interiora 1·2 cm., intima 1·3 cm. long., hæc 0·3 cm. lat. Flosculi dilute violacei deinde albi. Corollæ tubus 1·3 cm. long., inferne modo 0·05 cm., faucibus fere 0·25 cm. diam.; lobi 0·25 cm. long. Achænia 0·3 cm. long. Pappi setæ interiores 0·7–0·9 cm. long., exteriores circa 0·3 cm.

A plant evidently near *V. filipendula*, Hiern, from which it may be easily told by the tomentose underside of its leaves, which are not markedly narrowed towards the base, the more crowded inflorescences and shorter involucral leaves with a differently shaped appendage. *V. lasiolepis*, O. Hoffm., which I have not seen, is also closely allied to it, but, among other characters, differs in the much longer and narrower leaves not strongly scabrous above, and the larger heads.

VERNONIA GLABERRIMA, *Welw., ex O. Hoffm., in Bol. Soc. Brot.* xiii. (1896) 15.

Cazengo, on dry stony ground near Palmyra; *Gossweiler*, 648.

VERNONIA LAMPROPAPPA, *O. Hoffm., in Bol. Soc. Brot.* xiii. (1896) 14.

Angola, on high ground in primary thickets near Malange; *Gossweiler*, 1226.

ELEPHANTOPUS WELWITSCHII, *Hiern, Cat. Welw. Pl.* i. 540.

Angola, in thickets at N'Bango near Malange; *Gossweiler*, 1219.

FELICIA BARBELLATA, sp. nov. Annua, elata, caule tenui erecto pilis albis hispidis crebro munito distanter folioso sursum ramoso alibi ramulos paucos abbreviatos emittente, foliis parvis caulinis distantibus ramulorum magis approximatis sessilibus linearibus vel anguste linearibus obtusis piloso-hispidis, capitulis parvulis heterogamis radiatis multiflosculosis in corymbis paucicephalis ramulos inferiores coronantibus vel in corymbo terminali elongato digestis, pedunculis propriis sat elongatis raribracteatis, involucri late campanulati phyllis 3-serialibus anguste lineari-oblanceolatis exterioribus brevioribus acutis interioribus gradatim longioribus acuminatis omnibus dorso hispidis margine membranaceis, radii flosculis femineis 1-serialibus flosculis interioribus hermaphroditis intimis imminutis necnon sterilibus, receptaculo plano areolato, flosculis breviter exsertis, ligulis parvulis angustis, achæniis maxime compressis ambitu anguste obovatis appresse setulosis, pappi setis breviter barbellatis albis.

Hab. Angola, in shady spots of open woods at Pomça Uremba; *Gossweiler*, 1150.

Planta fere $\frac{2}{3}$-metralis. Folia 1·0–1·5 cm. long., vetustiora interdum adusque 0·3 cm. reliqua vix 0·1 cm. lat., ultima modo 0·5 cm. long. Corymbi ramulini 1–4-cephali, sæpissime 2·0–4·0 cm. long.; corymbus terminalis circa 20·0 cm. long. Pedunculi proprii graciles, piloso-hispidi, 1·5–4·5 cm. long.; horum bracteæ circa 0·3 cm. long. Capitula pansa 0·5 × 1·0 cm. Involucri phylla extima 0·3 cm., intermedia 0·4 cm., intima 0·5 cm. long. et 0·06 cm. lat. Ligula oblonga apice 3-denticulata, 0·15 cm. long. Achænia 0·15 cm., pappus fere 0·3 cm. long.

A rather remarkable plant because of the shortly barbellate setæ to the pappus and on this account approaching *Mairea*.

In the collector's note the ray-florets are said to be white in the dry state some are purple.

AMPHIDOXA FILAGINEA, *Fical. & Hiern, in Trans. Linn. Soc.*, ser. II. *Bot.* ii. (1881) 21 (*ex ic. et descript.*).

To this species must be referred specimens collected by Dr. R. F. Rand in Rhodesia, at Salisbury (No. 152) and Bulawayo (No. 351): these I named (Journ. Bot. xxxviii. (1900) 160) *Helichrysum declinatum*, Less., in error. The two plants are treacherously alike, and only careful dissection can reveal the difference between them.

In my former contribution (Journ. Linn. Soc., Bot. xxxv. (1902) 332) I proposed the name *Helichrysum achyroclinoides* for a Mt. Milanji plant collected by Mr. Alexander Whyte. Mr. Baker having already used this name for a Madagascar species, the plant in question may be known as H. SORDIDUM.

HELICHRYSUM ARGYROSPHÆRUM, *DC. Prodr.* vi. 174.

Rhodesia, four miles from Bulawayo on granite in sandy soil at 4700 feet; *F. Eyles*, 152.

H. MECHOWIANUM, *Klatt, in Ann. Naturhist. Hofmus. Wien*, vii. (1892) 101.

Angola, Kamanhiango near Malange; *Gossweiler*, 1183.

H. PETERSII, *Oliver & Hiern, in Fl. Trop. Afr.* iii. 349.

Angola, on the road between Malange and Catombe; *Gossweiler*, 1218.

HELICHRYSUM (*Chrysolepidea* § *Stœchadina*) GOSSWEILERI, sp. nov. Herbaceum, perenne, caulibus foliosis simplicibus e cauli repente prolixo squamifero oriundis dense araneoso-tomentosis, foliis parvis sessilibus oblongo- vel lineari-lanceolatis acutis vel setaceo-acuminatis obscure nervosis utrinque præsertim subtus araneoso-pubescentibus radicalibus e cauli repente oriundis oblanceolatis obtusis inferne in petiolum sat longum sensim angustatis reticulato-nervosis pubescentibus puberulisve, capitulis breviter pedunculatis parvis homogamis 10–11-flosculosis inferne araneosis in cyma polycephalo subaperto digestis, involucri turbinati phyllis 4-serialibus extimis brevioribus omnibus late oblongis membrana oblonga acuta aurea haud radiante terminatis, receptaculo parvo foveolato, flosculis inclusis, antherarum caudis simplicibus, achæniis immaturis anguste cylindricis dense papillosis, pappi setis ima basi connatis superne aureis scabridis.

Hab. Angola, Catombe near Malange, also Vulanzombe, where it springs up after bush-fires; *Gossweiler*, 1186 and 1198.

Caules fere semimetrales. Folia radicalia circa 10·0 cm. × 0·9 cm.; horum petiolus 3·0 cm. long., aliquanto complanatus. Folia caulina modice 2·0–3·0 cm. long. et 0·3–0·6 cm. lat., membranacea. Folia superiora imminuta (1·5 cm. × 0·3 cm.) et majus distantia. Cymæ 3·5–4·0 cm. diam. Pedunculi proprii solemniter 0·2–0·4 cm. long. Capitula 0·5 cm. × 0·4 cm. Involucri phylla extima 0·4 cm., reliqua 0·5 cm. long.; intermedia vix 0·2 cm., intima 0·15 cm. lat. Corollæ 0·4 cm. long. Achænia 0·1–0·13 cm. long., 0·04 cm. lat. Pappi setæ 0·4 cm. long.

Allied to *H. gerberifolium*, Sch. Bip., and apparently nearest *H. geminatum*, Klatt (Ann. Naturhist. Hofmus. Wien, vii. (1892) 101), but the present plant differs from that in clothing, simple branches, narrower leaves, araneose involucre, &c.

HELICHRYSUM (*Chrysolepidea* § *Stœchadina*) HENDERSONÆ, sp. nov. Fruticosum, ramosum, ramulis dense foliosis teretibus alboaraneoso-tomentosis, foliis sessilibus basi brevissime vaginantibus haud decurrentibus anguste linearibus mucronatis margine revolutis supra cito pubescentibus subtus araneoso-tomentosis subcoriaceis, capitulis parvulis heterogamis circa 40-flosculosis in corymbis parvis brevibus pedunculatis ramulos singillatim terminantibus digestis, bracteis linearibus subscariosis araneosis, pedunculis propriis capitula æquantibus vel paullo excedentibus araneosis, involucri campanulati basi araneosi ceteroquin glabri phyllis 4-serialibus lanceolatis (intimis lanceolato-oblongis) obtusis sursum in laminam auream haud radiantem sibi ipsis æquilongam transeuntibus, receptaculo areolato, flosculis inclusis, achæniis anguste ovoideis scabriusculis, pappi setis sursum scabriusculis necnon lutescentibus.

Hab. Nyika Plateau, Nyassaland; *Miss Henderson.*

Ramuli vetustiores reliquiis foliorum vaginarum onusti. Folia 1·0–2·0 cm. long., summum 0·2 cm. lat. Pedunculi 1·0–3·0 cm. long. Bracteæ modice 0·3–0·6 cm. long. Pedunculi proprii summum 0·5 cm. long. vel paullulum longiores. Corymbi 1·5–2·5 cm. diam. Capitula 0·4 cm. × 0·5 cm.; phylla 0·05–0·09 cm. lat., extima 0·2 cm., intermedia 0·25 cm., intima 0·3 cm. long. Receptaculum fere 0·2 cm. diam. convexum. Corollæ 0·2 cm.

long. Antherarum caudæ barbellatæ. Achænia 0·06 cm., pappus 0·25 cm. long.

This might easily be mistaken for *H. trilineatum*, DC., which, besides belonging to the *Lepicline* division of the genus, has somewhat different leaves and flowering heads. The affinity of the present plant is with *H. rutilans*, DC., and its allies, but the rigid habit and small, very narrow leaves at once serve as marks of distinction.

HELICHRYSUM (*Lepicline* § *Plantaginea*) VERBASCIFOLIUM, sp. nov. Planta herbacea omnimodo tomento densi griseo persistente obtecta, foliis radicalibus ovato-oblongis apice mucronatis deorsum in petiolum caulem arcte amplectantem et lamina delapsa eundem obtegentem longe desinentibus basi plurinervibus sed costa centrali exempta nervis minime perspicuis, scapo ascendente folia excedente vel æquante bracteis perpaucis oblongis gradatim imminutis onusto, capitulis parvis homogamis 13-flosculosis in glomerulum densiusculum aggregatis, involucri anguste campanulati inferne araneosi phyllis 4-serialibus oblongis extimis breviter acuminatis intermediis acutiusculis intimis (quæ angustiora) obtusis omnibus lamina haud radiante sibi ipsis fere æquilonga phyll. ext. dilute brunnea phyll. reliq. læte aurea præditis, receptaculo fimbrillifero, flosculis inclusis, pappi setis scabridis pallide luteis.

Hab. Nyika Plateau, Nyassaland; *Miss Henderson.*

Folia 12·0–17·0 cm. × 3·5–5·5 cm., basin versus modo 0·5–0·7 cm. lat.; petioli summum circa 1·5 cm. long. Scapus unicus mihi obvius 16·0 cm. alt.; hujus bractea infima 7·0 cm. × 1·7 cm., summa modo 0·7 cm. long. Glomerulus 3·0 cm. diam. Pedunculi proprii fere 0·3 cm. long. Capitula 0·9 cm. long., ægre 0·5 cm. lat. Involucri phylla extima 0·6–0·7 cm., interiora 0·85 cm. long.; intermedia 0·25 cm., intima 0·2 cm. lat. Receptaculum 0·15 cm. diam. Corollæ 0·45 cm. long. Antherarum caudæ breviter barbellatæ. Achænia 0·1 cm., pappus 0·55 cm. long.

Close to *H. nanum*, Baker (Kew Bull. (1898) p. 150, *non* Klatt, in Bull. Herb. Boiss. iv. (1896) p. 461), but with much larger leaves on shorter petioles, larger bracts to the scape, larger heads with broader involucral leaves, of which the inner ones are obtuse or at most obtusely acute, pubescent instead of

glabrous achenes, and a yellow pappus of nearly double the length.

HELICHRYSUM (*Lepicline* § *Decurrentia*) CHRYSOPHORUM, sp. nov. Herbaceum, satis elatum, ascendens, ramis gracilibus sparsim ramulosis longitrorsum costatis araneosis cito fere glabris, foliis anguste lineari-oblanceolatis acutis longe decurrentibus obscure 1- vel 3-nervibus supra scabridis subtus dense araneoso-tomentosis, capitulis parvulis heterogamis 5–6-flosculosis in cymis parvis longipedunculatis bracteatis araneosis e cymulis pedunculatis polycephalis compositis dispositis, involucri cylindrico-turbinati basi araneosi phyllis 3-serialibus oblongo-ovatis obtusissimis extimis quam interiora manifeste brevioribus intimis aliquantulum laceratis appendicibus aureis haud radiantibus, receptaculi paleis setaceis, flosculis fem. 1–2 horum corollæ limbo bene evoluto, flosculis hermaph. 3–4, achæniis minimis cylindricis papillosis, pappi setis scabriusculis albis.

Hab. Nyassaland; *J. Buchanan*, 776 of 1891 collection.

Folio ± 2·0 cm. long., summum 0·3–0·35 cm. lat., membranacea. Pedunculi circa 10·0 cm. long., horum bracteæ foliis similes nisi minores. Cymæ ipsæ circiter 1·0 cm. long. et 1·5–3·0 cm. lat. Cymulæ circa 0·5 × 0·7 cm. Capitula vix 0·3 cm. long., 0·13 cm. lat. Involucri phylla exteriora 0·2 cm., interiora 0·25 cm. long. Flosculi inclusi. Corollæ vix 0·2 cm. long. Fll. fem. lobi lineares, 0·05 cm. long. Achænia immatura 0·03 cm., pappi setæ 0·2 cm. long.

Close to *H. odoratissimum*, Less., but differing from it in the slender habit, smaller leaves, smaller and differently shaped capitula with not more than six florets, &c.

HELICHRYSUM (*Lepicline* § *Aptera*) DILUCIDUM, sp. nov. Herbaceum, elatum, caule ascendente tereti arcte araneoso-tomentoso tandem glabrescente, foliis sessilibus nequaquam decurrentibus linearibus sursum attenuatis basi obtusis trinervibus subcoriaceis supra laxe araneosis cito glabrescentibus et fuscescentibus subtus albido-tomentosis, capitulis parvis homogamis circa 24-flosculosis in cymis corymbosis terminalibus apertis longebracteatis polycephalis dispositis, bracteis foliis similibus nisi multo minoribus, pedunculis propriis sæpius capitula subæquantibus ut pedunculi dense araneoso-tomentosis, involucri campanulati omnino glabri phyllis 5-seriatis extimis manifeste brevioribus omnibus lamina comparate magna ovata (phyll. intimorum oblonga) obtusissima margine crenulata haud radiante brunneo-aurea onustis, receptaculo plano nudo, flosculis exsertis, antherarum caudis simplicibus, achæniis subcylindricis glabris, pappi setis scabridis albis.

Hab. Mt. Milanji, Nyassaland; *A. Whyte.*

Folia solemniter 5·0–7·0 cm. long., 0·4–0·5 (raro 0·7) cm. lat.; costæ laterales quam centrales minus perspicuæ etsi aspectabiles. Cymæ profecto evolutæ adusque 7·5 cm. diam., et 5·0 cm. long.; harum bracteæ summæ maxime imminutæ, inferiores 1·5–3·0 cm. long. Capitula 0·45 cm. long., 0·4 cm. diam. Involucri phylla extima 0·15 cm., interiora 0·25 cm., intima 0·3 cm. long. Corollæ 0·35 cm. long. Styli rami apice subcapitati. Achænia adhuc immatura 0·08 cm., pappus 0·3 cm. long.

To be inserted next *H. trilineatum*, DC., which has compact habit, different leaves, denser globose cymes, larger heads woolly at the base, with many more florets, &c.

HELICHRYSUM (*Lepicline* § *Aptera*) BULLULATUM, sp. nov. Verisimiliter suffruticosum, caule valido frequenter ramuloso ut ramuli bene foliacei densissime albo-tomentoso, foliis sessilibus lineari-lanceolatis acutis basi angustatis haud decurrentibus coriaceis obscure 3-nervibus supra mox araneoso-pubescentibus puberulisve et manifeste bullulatis subtus dense albo-tomentosis, capitulis parvis homogamis sæpissime 5-flosculosis in cymis brevibus permulticapitatis subsphæroideis lanatis se ipsis glomerulatis dispositis, involucri anguste cylindrici 3-serialis phyllis inter se æquilongis lamina ovato-oblonga obtusissima haud radiante straminea onustis, flosculis inclusis, corollis minimis harum lobis linearibus, antherarum caudis microscopice barbellatis, achæniis maxime crudis oblongis glabris, pappi setis sursum scabriusculis sordide albis.

Hab. Nyassaland; *J. Buchanan*, 20 of 1895 collection.

Folia summum 4·5 × 1·0 cm., modice vero 1·5–2·0 × 0·5–0·7 cm., supra fusca; costulæ pag. sup. impresse, pag. inf. tomento invito perspicuæ. Cymarum glomeruli 2·0–4·0 cm. long. et diam. Involucra 0·45 cm. long., 0·15 cm. diam. Corollæ modo 0·175 cm. long. Styli rami truncati. Achænia 0·03 cm., pappi setæ 0·15 cm. long.

Apparently near *H. hypoleucum*, Harv., but easily known by the bullulate leaves and the dense glomerules of narrow capitula with straw-coloured involucral appendages.

HELICHRYSUM SYNCEPHALUM, *Baker, in Kew Bull.* (1898) 151.

Mt. Milanji, Nyassaland; *A. Whyte.*

INULA KLINGII, *O. Hoffm., in Engl. Jahrb.* xxiv. (1898) 472.

Angola, Malange, behind the Governor's palace towards Catombe; *Gossweiler*, 1151.

INULA HENDERSONIÆ, sp. nov. Herbacea, subscaposa, caule crasso velutino superne piloso-pubescente, foliis approximatis magnis oblongo-oblanceolatis obtusis in petiolum nunc brevem nunc brevissimum sensim angustatis (junioribus sessilibus leviterque amplexicaulibus) margine impariter dentato-serratis supra scabridulis subtus secus nervos piloso-pubescentibus, capitulis parvis ad apicem pedunculi nutantis scapum revocantis folia bene excedentis primum dense fulvo-hirsuto-tomentosi tum piloso-pubescentis raribracteati in corymbo brevi oligocephalo digestis radiatis subhemisphæricis circa 60-flosculosis, involucri 5-serialis phyllis anguste lanceolatis sursum attenuatis exterioribus quam interiora manifeste brevioribus omnibus fulvo-hirsutis, receptaculo areolato, achæniis crudis parvis cylindricis papillosis obscure costatis, pappi setis 2-serialibus glabris stramineis acheniis multo longioribus.

Hab. Nyika Plateau, Nyassaland; *Miss Henderson.*

Caulis 0·6 cm. diam., subito ad 0·4 cm. contractus. Folia 15·0–20·0 cm. long., 4·0–5·0 cm. lat., membranacea; petioli dum adsint 2·0 cm. long., basi breviter vaginantes. Pedunculus fere 30·0 cm. alt., fistulosus; bractea vix 4·0 cm. long., glanduloso-denticulata, utrinque fulvo-pubescens; accedunt bracteæ perpaucæ juniores in involucri phylla transeuntes. Pedunculi proprii 0·3–0·8 cm. long. Capitula 1·0 cm. long. et diam. Involucri phylla extima 0·4 cm., interiora 0·8 cm. long., omnia apice fusca. Ligulæ oblongæ, 3-denticulatæ, 4-nervosæ, 0·6 cm. long. Corollæ fll. hermaph. 0·35 cm. long. Pappi setæ 0·2–0·3 cm. long.

At first sight much like *I. subscaposa*, S. Moore, but the larger leaves are sessile or at most shortly petiolate, the capitula are larger, with longer and broader involucral leaves, &c.

INULA GLOMERATA, *Oliver & Hiern, in Fl. Trop. Afr.* iii. 359.

Angola, rather rare in secondary thickets and open forests at N'Golo near Malange; *Gossweiler*, 1180.

I. GOSSWEILERI, sp. nov. Herbacea, caule erecto crebro folioso striato dense sericeo-hirsuto mox appresse pubescente, foliis radicalibus magnis oblanceolato-obovatis obtusis basi in petiolum longe decurrentibus supra leviter scabriusculis viridibus subtus pallidis pubescentibus, foliis caulinis subapproximatis parvis oblongis obtusis sessilibus interdum levissime amplexicaulibus margine denticulatis pergamaceis utrinque dilute fulvo-sericeis deinde pag. sup. pubescentibus, capitulis parvis discoideis multiflosculosis ad apicem ramulorum brevium solitariis vel sæpius paucis glomeratis, pedunculis propriis quam involucra brevioribus dense sericeo-hirsutis, involucri campanulati dilute fulvo-sericei 6-serialis phyllis anguste lanceolatis acutis interioribus quam extima plane longioribus intimis anguste linearibus, receptaculo foveolato, flosculis inclusis, achæniis cylindricis breviter sericeis pluristriatis quam pappi setæ 1-seriatæ glabræ stramineæ brevioribus.

Hab. In high grasses of the primæval forest between Malange and Catombe Villa; *Gossweiler*, 1213.

Stirps (ex scheda cl. collectoris) "1–2 ft." alt. Folia radicalia circa 30·0 cm. long., 5·0–7·5 cm. lat. Folia caulina 4·0–6·0 cm. × 1·5–2·0 cm., subtus eminenter reticulato-venosa. Internodia modice 1·5–2·0 cm. long. Ramuli laterales 2·0–3·5 cm. long.; horum folia 2·0 cm. long. vel minus. Capitulorum glomeruli 2·5 cm. diam. Capitula 1·3 cm. long., 2·0 cm. diam. Involucri phylla extima 0·6–0·8 cm., interiora 1·0–1·1 cm. long., omnia homochroa. Corollæ 0·7 cm. long. Achænia vix 0·2 cm. necnon pappi setæ 0·45–0·5 cm. long.

To be placed in the genus next *I. glomerata*, Oliver & Hiern, which has larger radical leaves with a different clothing and more lax reticulation, stem-leaves distant from each other and considerably larger, and somewhat smaller flowering-heads with obtuse outer involucral leaves.

PEGOLETTIA SENEGALENSIS, *Cass. in Dict. Sc. Nat.* xxxviii. 230.

Rhodesia, between Bulawayo and Victoria Falls; *F. Eyles*, 131.

Calostephane divaricata, *Benth., in Hook. Ic. Pl.* sub tab. 1111.

Rhodesia, Deka Siding (on railway between Bulawayo and Victoria Falls); *F. Eyles*, 82.

Geigeria Burkei, *Harv. Fl. Cap.* iii. 126.

Swaziland, mountains above Em Babaan; *J. B. Davy*, 2824.

Bidens ambiguus, sp. nov. Herbaceus, bispithameus, glaber, caule simplici gracili ascendente sparsim folioso, foliis sessilibus anguste linearibus obtusis integris vel raro breviter paucilobatis, lobis linearibus obtusis, capitulis mediocribus terminalibus solitariis longipedunculatis, involucri subhemisphærici phyllis exterioribus herbaceis interioribus subæquilongis lineari-lanceolatis obtusis extus puberulis phyllis interioribus ovato-oblongis obtusis membranaceis pluristriolatis sursum ciliolatis, receptaculi paleis ovatis obtusis, ligulis circa 8 ex involucro bene eminentibus luteis, achæniis nondum maturis late oblongis nequaquam alatis glabris vel fere glabris aristis 2 quam se ipsa brevioribus dentibus perpaucis nunc erectis nunc recurvis onustis vel etiam omnino calvis.

Hab. Angola, in open forests on the left bank of the river Quanze at Kiambella; *Gossweiler*, 1189.

Caulis obtuse quadrangularis, 0·15 cm. diam. Folia modica 2·5–3·5 cm. long., 0·1–0·15 cm. lat.; lobi dum adsint 0·3–0·4 cm. long. Pedunculi 10·0–18·0 cm. long., nudi vel bractea unica lineari circa 1·0 cm. long. præditi. Capitula pansa 0·8 cm. long., 2·5 cm. diam. Involucri phylla exteriora 0·6–0·7 cm. long., summum 0·13 cm. lat.; phylla interiora 0·75 cm. long., 0·2–0·25 cm. lat. Receptaculi paleæ 0·6 cm. long. Ligulæ 1·0 cm. long., ovato-oblongæ, margine crispulæ, apice 2-fidæ, 11–12-nervosæ. Disci corollæ 0·5 cm. long. Antheræ basi integræ. Styli rami appendice abbreviata coronati. Achænia 0·3 cm., pappi aristæ 0·2 cm. long.

Nearest *B. leneariloba*, Oliver & Hiern, but a weaker growing plant than that, with leaves entire or almost so, and different involucres and achenes. These latter organs are peculiar, and in this respect the plant may be regarded either as a *Bidens* or a *Coreopsis*; hence the trivial name selected for it.

B. croceus, *Welw., ex O. Hoffm., in Bol. Soc. Brot.* x. (1892) 177, var. verruciferus, var. nov.; achæniis crebro spinuloso-verrucatis infra apicem vero glabris.

Angola, Catombe near Malange; *Gossweiler*, 1210.

BEMBYCODIUM ATHANASIÆ, *Kunze, in Linnæa*, xvi. (1842) 316. (Pl. **14** A. figs. 1–3.)

I incorporated the type of this obscure plant in the Museum Herbarium a few years ago. It is a cultivated specimen from the Leipzig Garden, and formed part of the Auerswald Herbarium. Harvey makes no mention of this plant in 'Flora Capensis'; Bentham, however (Gen. Pl. ii. 417), though evidently without seeing a specimen, correctly refers it to *Athanasia.* The type above mentioned turns out to be identical with *Athanasia oligocephala*, DC., and the only noteworthy point about it resides in the leaves, of which some are a little above an inch in length.

LOPHOLÆNA SEGMENTATA, *S. Moore, in Bull. Herb. Boiss.* sér. II. iv. (1904) 1021.

Swaziland, open veldt near Miller's house; *J. B. Davy*, 2809.

GYNURA VITELLINA, *Benth., in Hook. Niger Fl.* 438, var. ANGUSTIFOLIA, var. nov. A typo distat ob folia margine solummodo dentata, comparate elongata, maxime angustata, modica 8·5–10·0 cm. long., 0·8–1·2 cm. lat., interdum 5·0–6·0 × 0·5–0·6 cm.

Angola, in marshy places near Pandono, Malange; *Gossweiler*, 1230.

G. SARCOBASIS, *DC. Prod.* vi. 300.

Rhodesia, in a shady granite cave on the Matopo Hills at 5000 feet; *F. Eyles*, 40.

CINERARIA ALCHEMILLOIDES, *DC. Prod.* vi. 307 (e descript.).

Orange River Colony, Bloemfontein; *Rehmann*, 3763. Cape Colony, Jaus (Western Region); *Schlechter*, 11208.

The above are, I believe, rightly named. There is not an authentic specimen of this species in the Museum, neither is there at Kew.

SENECIO ABYSSINICUS, *Sch. Bip., ex A. Rich., Tent. Fl. Abyss.* i. 438.

Angola, rather rare in cultivated ground about Malange; *Gossweiler*, 1208.

Senecio sycephyllus, sp. nov.; ramis e caule tenero simplici prostrato radicante ascendentibus piloso-hirsutulis tandem fere glabris, foliis parvis sessilibus circuitu oblongo-ovatis obtusis basi late amplexicaulibus margine lobatis denticulatisve membranaceis piloso-pubescentibus, capitulis parvis perpaucis in corymbo quam folia longiore dispositis heterogamis radiatis plurifiosculosis, pedunculis propriis involucra multoties excedentibus bracteis paucis setaceis instructis pubescentibus, involucri anguste campanulati ecalyculati phyllis circa 12 anguste linearibus acuminatis anguste marginatis extus pilosis, ligulis paucis involucrum longe excedentibus luteis, styli ramis truncatis penicillatis, achæniis crudis glabris, pappi setis scabriusculis albis.

Hab. Mt. Ruwenzori; *G. F. Scott Elliot*, 7965.

Folia 1·0–3·0 cm. long., 0·6–1·0 cm. lat., summa rara et imminuta, in bracteas transeuntia, saltem 0·5 cm. long.; lobi dum adsint ±0·4×0·5 cm. Pedunculi proprii circa 2·5 cm. long.; horum bracteæ 0·2–0·35 cm. Involucri phylla 0·65 cm. long., 0·05–0·075 cm. lat. Ligulæ oblongæ, apice breviter denticulatæ, 5-nervosæ, 1·0 cm. long., vel paullulum longiores. Disci corollæ 0·5 cm., styli rami 0·1 cm., pappi setæ 0·35–0·5 cm. long.

A very distinct little plant known by the habit, the clothing, the small, usually lobed, broadly amplexicaul leaves, &c. The affinity is apparently with *S. Vallis-gratiæ*, Bolus.

Senecio Ommannei, sp. nov. Herbaceus, elatus, glaber, caule verisimiliter simplici tereti eximie sulcato, foliis radicalibus ignotis caulinis elongatis anguste oblanceolatis obtusis vel obtuse acutis basin versus in petiolum alatum validum dorso insigniter pluricostatum longe ac sensim attenuatis margine crebro denticulatis membranaceis superioribus brevioribus necnon angustioribus et sessilibus basi breviter amplexicaulibus margine denticulato-undulatis, capitulis heterogamis radiatis circa 20-flosculosis in corymbo satis aperto polycephalo bracteato digestis, pedunculis propriis capitula multo excedentibus bracteis raris parvis lineari-lanceolatis summis subulatis et in calyculi phylla transeuntibus onustis, involucri anguste campanulati phyllis 11–13 oblongis vel oblongo-linearibus apice sphacelatis longitrorsum nervosis marginibus membranaceis, receptaculo rarifimbrillifero, ligulis 5 luteis ex involucro eminentibus, disci flosculis exsertis, styli ramis truncatis penicillatis, achæniis compressiusculis ceterum cylindricis 10-costatis glabris, pappi setis scabriusculis albis.

Hab. Steijns Farm, Johannesburg; *H. T. Ommanney*, 111.

Planta summum 4-metralis ex scheda cl. detectoris. Caulis deorsum 0·5–0·6 cm. diam. Folia inferiora (petiolo incluso) 30·0–45·0 cm. long., 4·0–fere 6·0 cm. lat.; horum petiolus 6·0–20·0 cm. long., sc. foll. super. magnopere abbreviatus; folia superiora 14·0–20·0 cm. × 0·8–2·0 cm., accedunt perpauca summa in bracteas transeuntes 3·0–4·0 × 0·2–0·3 cm. Corymbus 14·0 cm. long., circa 9·0 diam.; ejus bracteæ 0·25–1·5 cm. long. Pedunculi proprii modice 2·0–3·0 cm. long. Capitula 0·8 × 0·4 cm. Calyculi phylla perpauca, 0·2 cm. long. Involucri phylla 0·5 cm. long. Ligulæ (lamina) 0·6 cm. long., oblongo-oblanceolatæ, infra apicem obscure denticulatæ, apice obtusissimæ, 4-nervosæ. Disci corollæ 0·7 cm. long., tubo basi subito dilatato. Styli rami 0·1 cm. long. Achænia 0·15 cm., pappus 0·6 cm. long.

Allied to but a much bigger plant than *S. Serra*, Sond., the inflorescence of the two being very similar in outward appearance. The plant here described has much longer and relatively broader leaves, with a somewhat different margin, also only five ray-florets and fewer florets in the disc, &c.

SPHENOGYNE BRACHYLOBA, *Kunze, in Linnæa*, xx. (1847) 21. (Pl. **14** B. fig. 4.)

This plant has been overlooked by Harvey, as indeed has the entire memoir (the author's third 'Pugillus') of which it forms part. The type is in the British Museum, where it is represented by two Leipzig Garden specimens from the Auerswald Herbarium. It undoubtedly belongs to section *Thelythamnos*, characterized by the absence—or narrowness when present—of a membranous edge to the outer involucral leaves, and this despite the fact that Kunze himself refers it to section *Xerolepis*, which contains species with all the involucral leaves broad-edged. Different from anything I have seen in the British Museum and at Kew, the affinity of this plant is evidently with *S. tenuifolia*, DC., with which it agrees in having the same pseudo-scapose inflorescence, although the leaves of *S. brachyloba* are more scattered, and lobed instead of entire. The somewhat smaller involucral leaves also yield an easily recognized point of difference between the two species.

CARDUUS LEPTACANTHUS, *Fres., in Mus. Senckenb.* iii. (1845) 70, var. NYASSANA, var. nov.; caulis abunde foliolo-spinosus. Foliorum lobi quam ii typi insigniter minores et comparate latiores (sc. solemniter ± 1·0 cm. long. et lat.). Capitula summum 2·0 cm. long. et 1·5 cm. diam. Achænia 0·4 cm., pappi setæ 1·0–1·5 cm. long.

Nyassaland; *Buchanan,* 219, 577. Myika Plateau; *Miss Henderson.* (Also, at Kew, Mt. Malosa; *A. Whyte* sine no.)

A well-marked variety, at once distinguishable from the type and from its var. *Steudneri,* Engl., which do not range so far south.

CENTAUREA RHIZOCEPHALA, *Oliver & Hiern, in Fl. Trop. Afr.* iii. 438.

Wase, Northern Nigeria; *Dr. Kumm.*

PLEIOTAXIS RUGOSA, *O. Hoffm., in Engl. Bot. Jahrb.* xv. (1893) 538.

Loanda, Cazengo, on Monte Lau, rare; *Gossweiler,* 687.

P. EXIMIA, *O. Hoffm. l. c.* 539.

Angola, near Malange towards Catombe; *Gossweiler,* 1209. Native name "Hácca."

P. AUTUNESII, *O. Hoffm. l. c.* 539.

Among high grasses near the Villa Catombe, near Malange; *Gossweiler,* 1214.

DICOMA WELWITSCHII, *O. Hoffm., in Engl. Bot. Jahrb.* xv. (1893) 544.

Angola, not uncommon in open forests between Catombe and Malange; *Gossweiler,* 1211.

DICOMA (§ *Pterocoma*) SUPERBA, sp. nov. Herbacea, caule e rhizomate crasso longifibrillifero erecto simplici vel apicem versus tantum breviter ramoso folioso subtereti longitrorsum multisulcato brevissime sericeo-tomentoso dein glabrescente, foliis magnis ovatis (junioribus ovato-oblongis) obtusis basi vaginante amplexicaulibus in longitudinem 5-nervibus supra glabris eximie reticulatis subnitentibus subtus intricate membranaceo-albo-tomentosis tenuiter coriaceis, capitulis paucis majusculis homogamis circa 22-flosculosis pedunculis valde abbreviatis bracteis involucri phylla mentientibus munitis ex axillis superioribus

oriundis suffultis, involucri turbinati phyllis multiseriatis lineari-lanceolatis spinoso-acuminatis rigidis margine anguste membranaceis languide argyreis intimis quam interiora brevioribus membranaceis itaque vero acuminatis, receptaculo alte foveolato, flosculis inclusis, corallarum lobis reflexis, antherarum caudis barbellatis, achæniis dense sericeis quam pappi setæ pluriseriatæ multo brevioribus.

Hab. Rather rare in the young open forests towards Catombe; *Gossweiler*, 1216.

Planta ⅔-metralis. Folia 12·0–14·0 cm. × 5·0–7·5 cm., vagina (quæ 0·3 cm. long.) exclusa; folia superiora 6·0–8·0 cm. long. Pedunculi circa 1·0 cm. long., cauli arcte applicati. Capitula 3·0–3·5 cm. long., 2·0 cm. vel paullulum ultra lat. Involucri phylla extima circa 1·6 cm. × 0·15 cm., interiora 2·5 cm. × 0·3 cm., intima circa 1·8 cm. long. Corollæ tubus 0·6 cm., lobi 0·5 cm. long. Antheræ apice acutæ. Achænia 0·2 cm. long., fere totidem lat. Pappi setæ 0·9 cm. long.

Var. ANGUSTIFOLIA. Folia lanceolata, breviter amplexicaulia, modice 5·0–7·0 cm. × 1·2–1·8 cm. Capitula paullo ultra 2·0 cm. long. et 1·5 cm. lat.

Hab. Malange, in thickets at N'Bango; *Gossweiler*, 1215.

Near *D. sessiliflora*, Harv., and *D. membranacea*, S. Moore, but easily distinguished by the quite different involucral leaves. The description of *D. Poggei*, O. Hoffm. (Engl. Jahrb. xv. (1893) 546) suits it in some respects, but the leaves of this are different, as also the inflorescence. Moreover, the heads are described as 4 cm. long and no less than 3·5 cm. broad, *i. e.* nearly hemispherical, and the involucral leaves are evidently unlike.

Mr. Gossweiler notes that the florets are purplish red.

DICOMA PLANTAGINIFOLIA, *O. Hoffm., in Engl. Bot. Jahrb.* xv. (1893) 546.

Angola, thickets at N'Bango, Malange; *Gossweiler*, 1207.

D. RADIATA, *Less., in Linnæa*, v. (1830) 278 (e descript.). (Pl. **15.**)

The only specimens of this species known to me are in the British Museum, and were collected by Francis Masson. Of these specimens an elaborate description is among the Solander MSS., under an unpublished name which, for obvious reasons, is not reproduced here. The specimens agree in every respect

with Lessing's description; indeed in regard to the leaves, they are more like the specimens seen by Lessing than those which Harvey had before him, inasmuch as while the first-named gives 4–10 lines as the length of those organs, and Harvey (Fl. Cap. iii. 516) says the length is 1–1½ in., on Masson's specimen there are no leaves reaching an inch in length, the largest measuring not more than 7 or at most 8 lines.

On account of the rarity of *Dicoma radiata* it has been judged worthy of the accompanying plate, from the details of which the plant's special features will be readily apprehended. The habitat, according to Solander, is the Karroo beyond Hartegnas Kloof, in very dry places ("locis aridissimis").

CREPIS BUMBENSIS, *Hiern*, *Cat. Welw. Pl.* i. 616.

Angola, along the road from N'Golo to Oulangombe; *Gossweiler*, 1172.

LACTUCA SCHULZEANA, *Büttn.*, *in Verhandl. Bot. Ver. Brand.* xxxi. (1889) 72 (e descript.).

Loanda, Cazengo, among high grasses on gravelly ground near Monte Bello; *Gossweiler*, 668.

An erect green or purplish herb 6–15 feet high. Stem up to an inch in diameter. Inflorescence 4 feet or more long. Ligules milk-white. Except for the white florets agrees fairly well with Büttner's description.

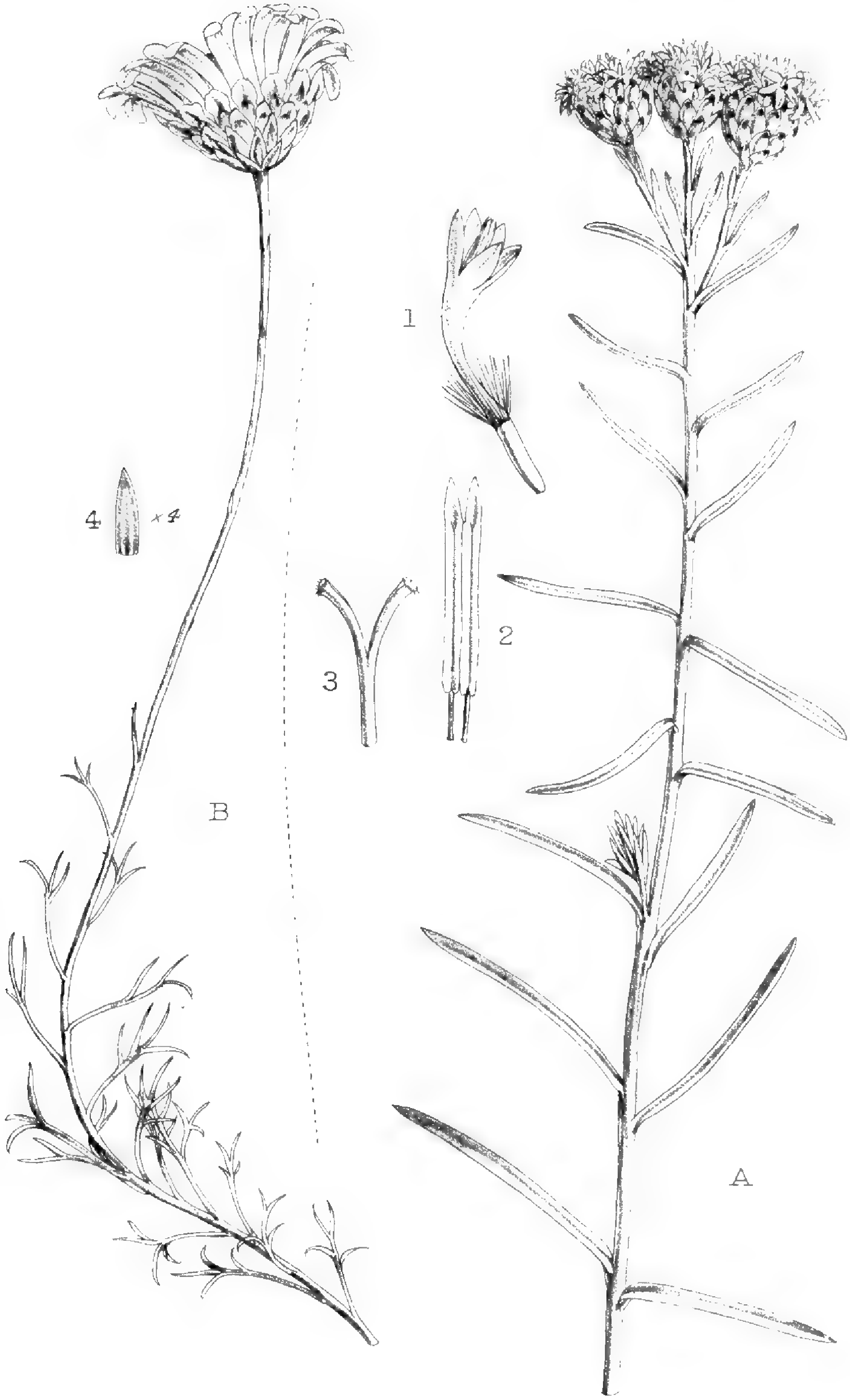
[NOTE.—The following description was inadvertently omitted; it should come after *T. griseiflora* on page 306.—S. L. M.]

TRICALYSIA MILANJIENSIS, sp. nov. Fruticosa, ramulis ascendentibus mox apertis tenuibus bene foliosis pubescentibus demum glabris novellis minute sed dense pubescentibus, foliis lanceolatis vel oblongis sursum aliquando cuspidulatis nunc acutis nunc obtusis rarissime obtusissimis apice solemniter longiuscule mucronatis basi in petiolum brevem angustatis papyraceis supra costa media puberula exempta glabris necnon obscure nitentibus subtus in nervorum axillis passim pubescentibus ceterum glabris costis secundariis utrinque circa 8 horizontalibus leviterve ascendentibus marginem versus dichotomis, stipulis e basi brevi ovata in appendicem longam exeuntibus extus pubescentibus, axillis plurifloris, floribus breviter puduneulatis, calyculo duplici

1
2 ×4
5 ×4
3 ×4
6 ×9
4 ×5

S.L. Moore del.
J.N. Fitch lith.
West, Newman imp.

POLYSPHÆRIA ZOMBENSIS *S. Moore.*



S. L. Moore del
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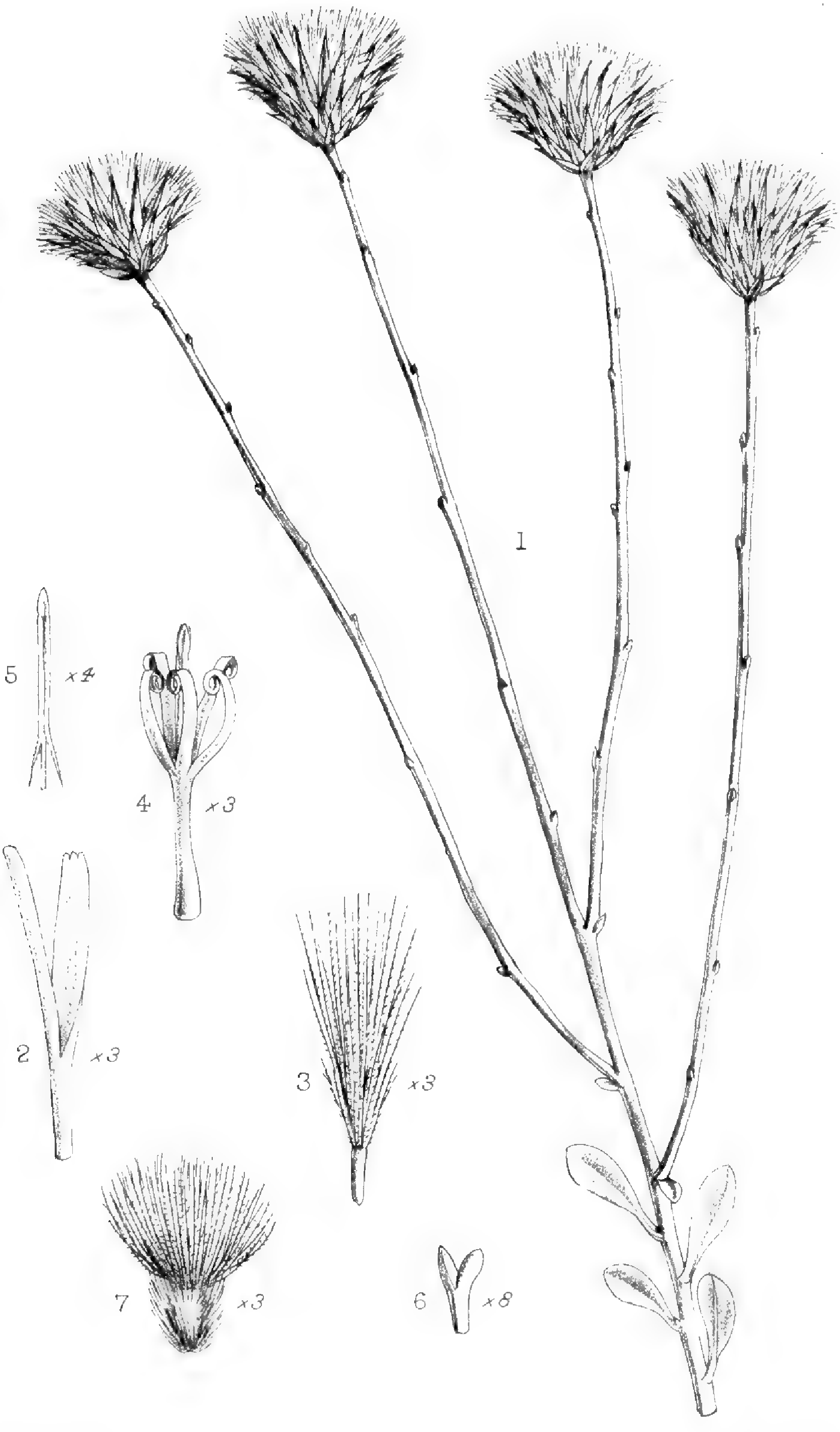
West, Newman imp

A. BEMBYCODIUM ATHANASIÆ. } *Kunze.*
B. SPHENOGYNE BRACHYLOBA. }


1
5 ×4
4 ×3
2 ×3
3 ×3
7 ×3
6 ×8

S.L. Moore del.
J.N. Fitch lith.

West, Newman imp.

DICOMA RADIATA. *Less.*

longiuscule 2–4-dentato dentibus subulatis ut calyx pedunculusque sericeo, calycis tubo (ovario) subsphæroideo limbo 6-lobo lobis subulatis limbo paullo longioribus, corollæ tubo calyce multo longiore limbi lobis oblongis acutiusculis quam tubus multo brevioribus extus pubescentibus margine ciliolatis, antheris sessilibus subinclusis, stylo incluso puberulo hujus ramis linearibus, ovulis pro loculo 2.

Hab. Nyassaland, Mount Milanji; *A. Whyte.*

Ramuli 0·1–0·15 cm. diam., cortice cinereo obducti. Foliorum limbus 4·0–6·5 cm. × 1·8–2·5 cm. (rarissime 3·0 cm.); petioli 0·5 cm. long. Stipulæ sæpe adusque 0·8 cm. long. Calyculi pars exterior interiorem æquans, ambo in toto 0·3 cm. long.; hujus lobi 0·15 cm. long. Calycis tubus (ovarium) 0·075 cm. long.; limbi pars indivisa 0·18 cm., lobi 0·2 cm. long. Corollæ tubus intus puberulus, 0·7 cm. long., basi 0·1 cm. faucibus 0·225 cm. diam., lobi 0·4 cm. long. Antheræ 0·3 cm., stylus 0·3 cm., ejus rami 0·12 cm. long.

Somewhat aberrant from the genus on account of the sessile anthers, though agreeing with it in all other respects. Among other points the long subulate teeth to the calyculus and calyx afford an easy means of distinguishing the plant.

EXPLANATION OF THE PLATES.

Plate 13. *Polysphæria zombensis,* S. Moore.

1. View of a branch of the plant, nat. size. 2. A calyx with its investing calyculus. 3. A flower. 4. A corolla opened, showing the stamens. 5. Style and stigma. 6. Ovary in longitudinal section showing the single pendulous ovule in either cell.

Plate 14.

A. *Bembycodium Athanasiæ,* Kunze. B. *Sphenogyne brachyloba,* Kunze.

Both these are from specimens in the British Museum derived from the Leipzig Garden. A. Fig. 1. A detached floret. 2. Two anthers. 3. Style. B. Fig. 4. An outer scale of the involucre showing only a very faintly indicated membranous edge.

Plate 15. *Dicoma radiata,* Less.

1. A view of a portion of the plant, nat. size. 2. One of the neutral bilabiate florets from the circumference of a head. 3. Achene and pappus of a circumferential floret. 4. One of the central hermaphrodite actinomorphic florets. 5. Anther from same; and 6, stigmatic arms. 7. A ripe achene from the centre of the head, showing its comparatively short pappus of very numerous hairs.

On *Taiwania*, a New Genus of Coniferæ from the Island of Formosa. By BUNZŌ HAYATA, Tōkyō. (Communicated by Dr. MAXWELL T. MASTERS, F.R.S., F.L.S.)

[Read 5th April, 1906.]

(PLATE **16.**)

THE very interesting Conifer described in this paper was kindly sent to me by Mr. N. Konishi, Government Expert of Formosa. It was obtained by him with several other species on the western slope of Mt. Morrison, at an altitude of 2000 metres.

TAIWANIA *, *Hayata*, n. g.

Flores monoici? ♂ . . . . . ♀. Strobilus subglobosus, bracteis minutissimis; squamæ multiseriatæ laxiuscule spiraliter imbricatæ parum induratæ apice squarroso-patentes persistentes obovatæ apice leviter mucronatæ basi cuneatæ. Semina ad medium squamarum fertilium 2 reversa oblonga, testa coriacea duriuscula, ala angusta cincta; embryo 2-cotyledoneus.—Arbor sempervirens dense foliata, ramis patentibus. Folia squamæformia spiraliter conferta adnato-decurrentia, in ramis vegetis anguste lineari-falcata incurvo-erecta 4-gona, angulo dorsali prominente. Strobilus terminalis.

TAIWANIA CRYPTOMERIOIDES, *Hayata*, n. sp. Arbor. Folia polymorpha, rami adulti squamæformia triangularia breviter acuta carinata 5 mm. longa, 3 mm. lata per totam fere faciem ramo adnata; ramuli superioris falcato-incurva decurrentia 6 mm. longa, 3 mm. lata; rami vegeti aceroso-linearia latere compressa superne et subtus carinata, rhombeo-tetragona in sectione, 15 mm. longa. Strobilus subglobosus, 10–13 mm. longus, squamis numerosis 15, parum induratis margine tenuibus, apice mucronatis obcordatis vel obconicis 8 mm. longis, 5 mm. latis, basi additis bracteis minutissimis, squamis inferioribus vacuis minoribus. Semina oblonga cum alis 6 mm. in longitudine, alis utrinque sinuatis; albumen carnosum; embryo oblongus, $2\frac{1}{2}$ mm. longus; cotyledones 2, planæ.

[* The generic name is derived from Taiwan, the Chinese name of the Island of Formosa; the generic name was originally and provisionally given as *Taiwanites*, an appellation now suppressed in favour of the permanent name *Taiwania*.]

9
10
11
12
13
4
5
2
3
7
8
6

B Hayata del.
J. N. Fitch lith.

West, Newman imp.

TAIWANIA CRYPTOMERIOIDES.

Hab. Ushōkō, Shorinzan, Rinkiho, ad pedem montis Morrison ad 2000 m., leg. N. Konishi (Feb. anno 1904).

This plant is very interesting on account of the remarkable form of the cones, which differ from those of any genus at present known to me, so that it is very difficult to establish clearly its relation with other forms.

The habit is that of *Cryptomeria,* while the cone bears some resemblance to that of *Cunninghamia.* In external appearance the cone is like that of *Tsuga,* but differs so greatly in its structure, that this hardly needs pointing out.

So far as my knowledge extends, the plant comes nearest to *Cunninghamia* in the structure of its cones, as seen in the arrangement of the seminiferous scales, in the presence of the minute bract *, in the attachment and position of the ovule, and in the shape of the seed, wing, albumen, and embryo. But it differs from that genus in the absence of the secondary squama and in the number of the ovules (two on each scale). These two points and the even more strikingly different habit of the plant do not allow me to place it in *Cunninghamia,* and it seems better to regard the plant as representing a new genus, *Taiwania.*

EXPLANATION OF PLATE 16.

Fig. 1. Fragment of a branch, natural size.
2. Fragment of a young branch, natural size.
3. Leaves from a fertile branch, enlarged.
4. Leaf from a young sterile branch.
5. Scales of the cone with minute bracts at the base.
6. Scale seen from within, showing two winged seeds.
7. Scale showing two winged seeds, one partially hidden behind the other.
8. Scale from the inner side, seeds taken off, showing the traces where the seeds were attached.
9. Scale of a young cone with two abortive ovules.
10. Ovule showing its reversed position.
11. Seed.
12. Albumen.
13. Embryo.

(Figs. 2 to 13 enlarged.)

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* *Cunninghamia* is described as having "Bracteæ distinctæ nullæ" or "Bracteæ nullæ" in "Sieb. et Zucc. Fl. Jap. ii. pp. 6 et 8," and in "G. Gordon, The Pinetum, p. 76," as "without bracts." But I convinced myself that there is often, if not always, a minute bract at the base of each scale. [See Masters, in Journ. Linn. Soc., Bot. vol. xxx. (1895) p. 25.]

Correction of *Widdringtonia equisetiformis* to *Callitris robusta*.

By MAXWELL T. MASTERS, M.D., F.R.S., F.L.S.

IN the Journal of the Linnean Society, Botany, vol. xxxvii. (1905) p. 271, I published a description of what I then considered to be a new species of *Widdringtonia*, under the name of *W. equisetiformis*. I had, on a previous page, noted it as exceptional in its characters and as serving to break down the distinction between the Australian genus *Callitris* and the South African *Widdringtonia*. I am indebted to Mr. R. T. Baker, of the Technological Museum, Sydney, for pointing out that my supposed new species is not a true native of South Africa, but that it has been introduced from Australia and is none other than *Callitris robusta*. I believe Mr. Baker is right in his suggestion, and in making the necessary correction I am pleased to find the distinction between the two genera thus satisfactorily confirmed and not invalidated by an interloper.

19th May, 1906.

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BOTANY

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The fourth volume, for 1904, is now in the press.

B. DAYDON JACKSON,

General Secretary, Linn. Soc.

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THE JOURNAL

OF

THE LINNEAN SOCIETY.

VOL. XXXVII. **BOTANY.** No. 261.

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Ecology of Woodland Plants in the Neighbourhood of Huddersfield. (Figs. 1–70.) By T. W. Woodhead, F.L.S.*

[Read 15th December, 1904.]

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Introduction.

The study of plant associations is being vigorously prosecuted in Britain at the present time, and several parts of the country have been surveyed. These surveys cover fairly extensive areas, and the results so far have been indicated on ½-inch or 1-inch to the mile maps.

The aim of the present investigation has been to pay special attention to a small area and examine in some detail features which had to be omitted altogether or only slightly dealt with in the primary surveys, and thus determine whether more detailed work would lead to profitable results. While the object of the primary survey was to illustrate the chief plant associations, the present paper rather attempts to bring out the dominant factors affecting the distribution and modifications of a limited number of the commonest species which form the undergrowth of our woodlands. The distribution of these has been traced in the uncultivated areas of a small portion of the West Riding of Yorkshire to the South and West of Huddersfield, a district included in the Survey by Smith & Moss (Leeds & Halifax District), and reference should be made to this for a general account of the vegetation of the district.

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* This paper has been accepted as a dissertation for the degree of Ph.D. by the University of Zürich.

The area selected is favourable in that it affords considerable variation in altitude (1700 to 250 feet), in rainfall (50 to 32 inches), in temperature (42° F. to 47°·5 F.), in exposure to prevailing winds, in soil conditions—*e. g.*, deep ill-drained peat, shallow, relatively dry peat, humus, and soils derived from the denudation of coarse millstone-grit, fine-grained coal-measure sandstones, shales, and clays; and hence there are considerable differences in available water and inorganic salts for plant-food.

The study also throws light on the changes that have occurred in the vegetation of the district as a result of altered conditions.

The problems to be considered therefore were the investigation of the conditions affecting the distribution of the common plants of the undergrowth with reference to soil, moisture, exposure to wind, light, and shade, and to compare the tissues of the several species occurring under these various conditions. The species examined included, among others: Bracken (*Pteris aquilina*, Linn.), Bluebell (*Scilla festalis*, Salisb.), Quick or Creeping Soft Grass (*Holcus mollis*, Linn.), Wavy Hair-Grass (*Deschampsia flexuosa*, Trin.), Bilberry (*Vaccinium Myrtillus*, Linn.), Dog's Mercury (*Mercurialis perennis*, Linn.), Yellow Dead-nettle (*Lamium Galeobdolon*, Crantz), and Hog-weed or Cow-Parsnip (*Heracleum Sphondylium*, Linn.).

A very considerable amount of detailed work remains to be done in every branch of the subject, especially with regard to soils. The observations here recorded can, therefore, only be regarded as preliminary to more extensive work; and it is also important that similar examinations should be made of other selected areas and compared, for it is only by such comparisons that we can hope to arrive at the most satisfactory results.

Some of the observations contained in this paper were communicated to Section K (Botany) at the Southport Meeting of the British Association in 1903, and further results communicated to that Section at the Cambridge Meeting in 1904.

A prolonged absence from England has occasioned delay in the publication of this paper. Since its completion several important contributions have appeared or have come to my notice, and I have taken the opportunity to include references to many of them. In this connection I wish to thank Prof. Hans Schinz of the University of Zürich, and Prof. C. Schröter of the Polytechnicum, Zürich, for their kindness in granting me permission to use the excellent libraries connected with these and other institutions.

ECOLOGY IN BRITAIN.

In 1836 Hewitt Cottrell Watson contributed a short paper (98) to a discussion, initiated by R. B. Hinds (48) the previous year, on the construction of Maps illustrating the distribution of plants. The ideas in the minds of botanists at the time were concerned chiefly with mapping species. Watson's knowledge of the distribution of plants, however, led him to see that two methods were possible. Not only could the distribution of species be thus indicated, but maps of a very different type could be produced which would indicate vegetation. Although this idea was in Watson's mind, it was eventually crowded out in a statistical study of the distribution of species (100).

The present study of Plant Associations and Ecology in Britain, as elsewhere, has been based upon and greatly influenced by the admirable work of Warming (102), about which it is impossible to speak too highly. The works of other Continental botanists have also had a marked effect, especially those of Beck (4), Drude (25), Flahault (29), Graebner (36), Kerner (52), Schröter (84), and Schimper (83). Running close upon these are the researches of American Ecologists, who have recently shown great activity in this direction; and the publications of Pound and Clements (79), Cowles (18), Harshberger (44), Ganong (33), MacMillan (63), and others have taken a permanent place amongst the contributions to this subject. For a more extended bibliography a recent paper by Clements (14), also his excellent 'Research Methods in Ecology' (15), may be usefully consulted, as well as numerous papers during recent years in the 'Botanical Gazette.' Although these deal often with areas widely removed from the one under consideration, they contain abundant observations capable of general application, and I have profited much by their perusal.

But the influence, direct and indirect, of Flahault is especially noteworthy, for it was through his pupil Robert Smith that the study of plant associations first gained a permanent footing here.

Smith applied Flahault's system in Scotland, and in this new area found it necessary to somewhat modify it, and eventually he produced the first vegetation map in Britain, dealing with the Edinburgh district (86). Unfortunately, on the eve of publication of a second map dealing with Northern Perthshire (87) he died, and the study of Plant Geography was much the poorer by the loss of an able and most enthusiastic worker. However, the subject was at once taken in hand by his brother, William G. Smith, who has since actively continued the work, not only in Scotland, where other maps dealing with Forfar and Fife have been published (87), but two areas in West Yorkshire (88, 89) have also been mapped with the assistance of C. E. Moss and W. M. Rankin, and other areas in the North of England by F. J. Lewis (57); while in the 'Flora of Halifax' an interesting account of the vegetation of the parish is given by W. B. Crump (20). To all these I am indebted in many ways, and to the suggestions of Dr. W. G. Smith; whilst to Prof. C. Schröter I am especially indebted for much help in connection with the literature dealing with the various branches of the subject, and I have profited much by his kindly criticisms.

I.—WOODLAND VEGETATION MAPS.

a. *A typical Mixed Deciduous Wood in the Coal-Measure Area.*

The broad features of the vegetation having thus been studied, it has been my endeavour to carry the problem a step further by paying special attention to a very limited area.

The first attempts were made to map in detail the dominant plants in a small wood, and Birks Wood (a portion of the somewhat extensive Woodsome Woods near Huddersfield) was selected, as being most accessible. For this purpose several tracings were made from the 25-inch survey map, and on these the distribution of the commonest species was indicated. The first map (fig. 1, p. 338) indicates the distribution of the dominant trees, the dotted areas showing the distribution of shade trees, chiefly Sycamore (*Acer Pseudo-platanus*), Elm (*Ulmus montana*), and Beech (*Fagus sylvatica*). The lines show the distribution of Oak. A few other species are indicated by signs.

In making a primary examination to determine the shade-areas, photographic printing-paper was used.

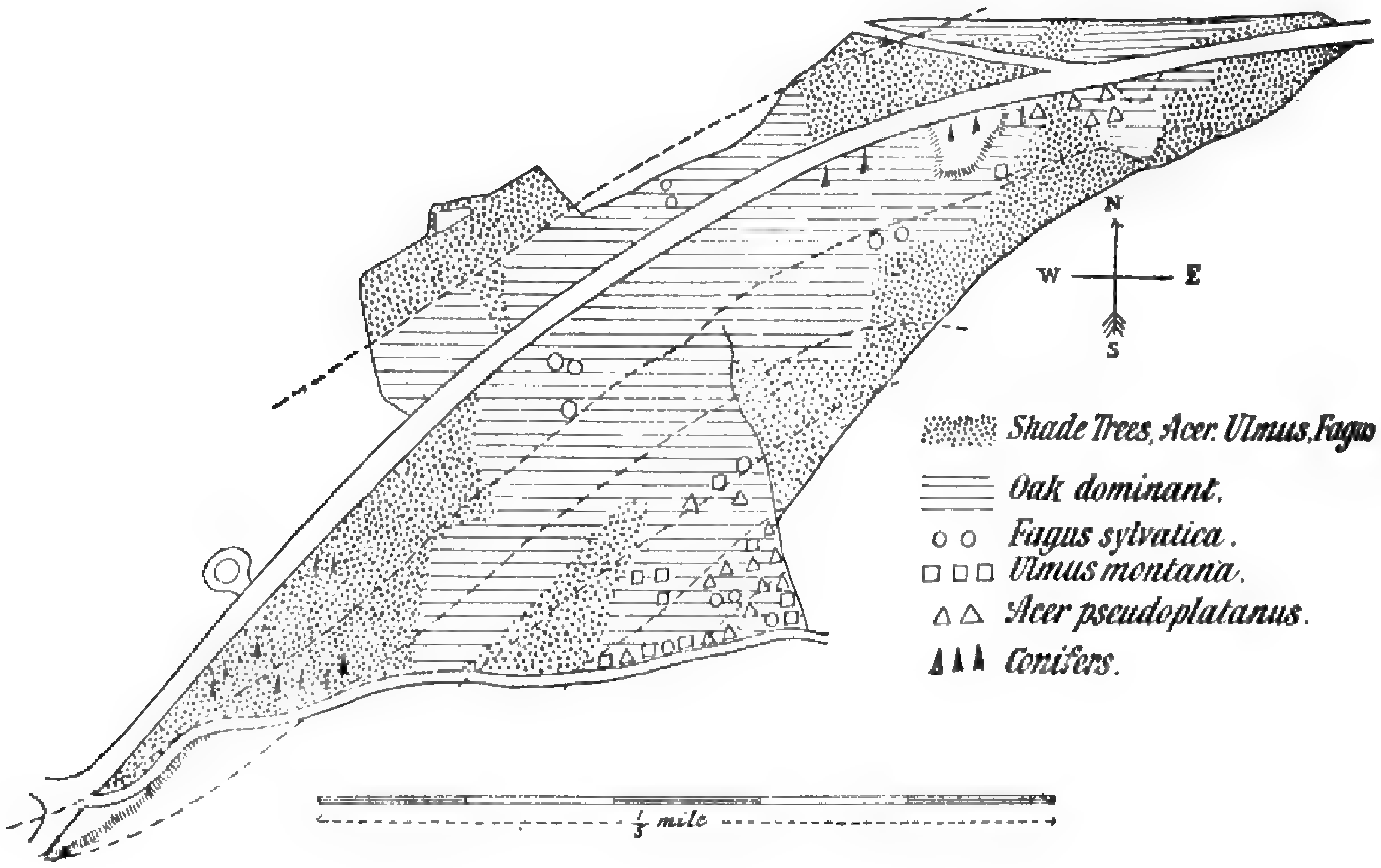
A piece of printing-paper was exposed to bright light for ten seconds and this was used as a standard. This shade (as seen through the glass to be used) was copied as carefully as possible in oil-colour and then cut up into small pieces. Printing-frames were made of 3 × 1 inch glass slips backed with opaque paper in such a way as to form envelopes or pockets with glass fronts. A piece of the standard colour was pushed down to the lower end of the pocket, the upper half receiving a strip of printing-paper. The frames when filled were taken into the wood and a preliminary test made in the open; then a set was exposed simultaneously in the area to be examined, and a record taken of the time required to print to the depth of the standard. A somewhat similar but more elaborate method was devised by Wiesner (107), but his paper did not come to my notice until after these observations were made.

Considerable differences were found under the same species of tree in different parts of the wood, owing to the condition of the tree, the mode of its growth, closeness of planting, and the like. Again, the "Mosaic" of illuminated and shaded areas under the tree introduced another disturbing element and made it difficult to indicate in numbers the precise amount of shade produced for a given species; but so obvious was the difference between groups of trees composed of *Acer*, *Ulmus*, and *Fagus* on the one hand, and those consisting of *Quercus* and *Betula* on the other, and so frequently did these species occur in masses together, that to indicate the former as a "shade"-area and the latter as a "light"-area gave a useful working basis.

Cieslar (12) has shown, by using Wiesner's method, how great is the effect of shade on the production of humus and in influencing the number of species occurring under a given tree. He was, however, working under the very uniform conditions of planted Beech forests of determined "Durchforstungsgrad," and numbers under these conditions could more easily be given.

The next step was to map the undergrowth, and after several unsuccessful attempts to show the distribution of the various species on one map, it was decided to map the more abundant species separately. The commonest and most striking plant is the Bracken (*Pteris aquilina*), and it was therefore taken first. Fig. 2 shows its distribution. A comparison of the tree-map with this suggested unmistakably that the distribution of Bracken was determined to a considerable extent by the dominant tree: that under trees with an open canopy like Oak and Birch, which, while affording much protection, admit a large amount of light, the Bracken flourishes; but under trees with a close canopy, such as Sycamore, Elm, and Beech, much light is cut off; and a comparison of figs. 1 and 2 will show that in these areas Bracken is almost or entirely absent—that is, the shade produced is evidently an important factor in limiting its distribution.

Fig. 1.



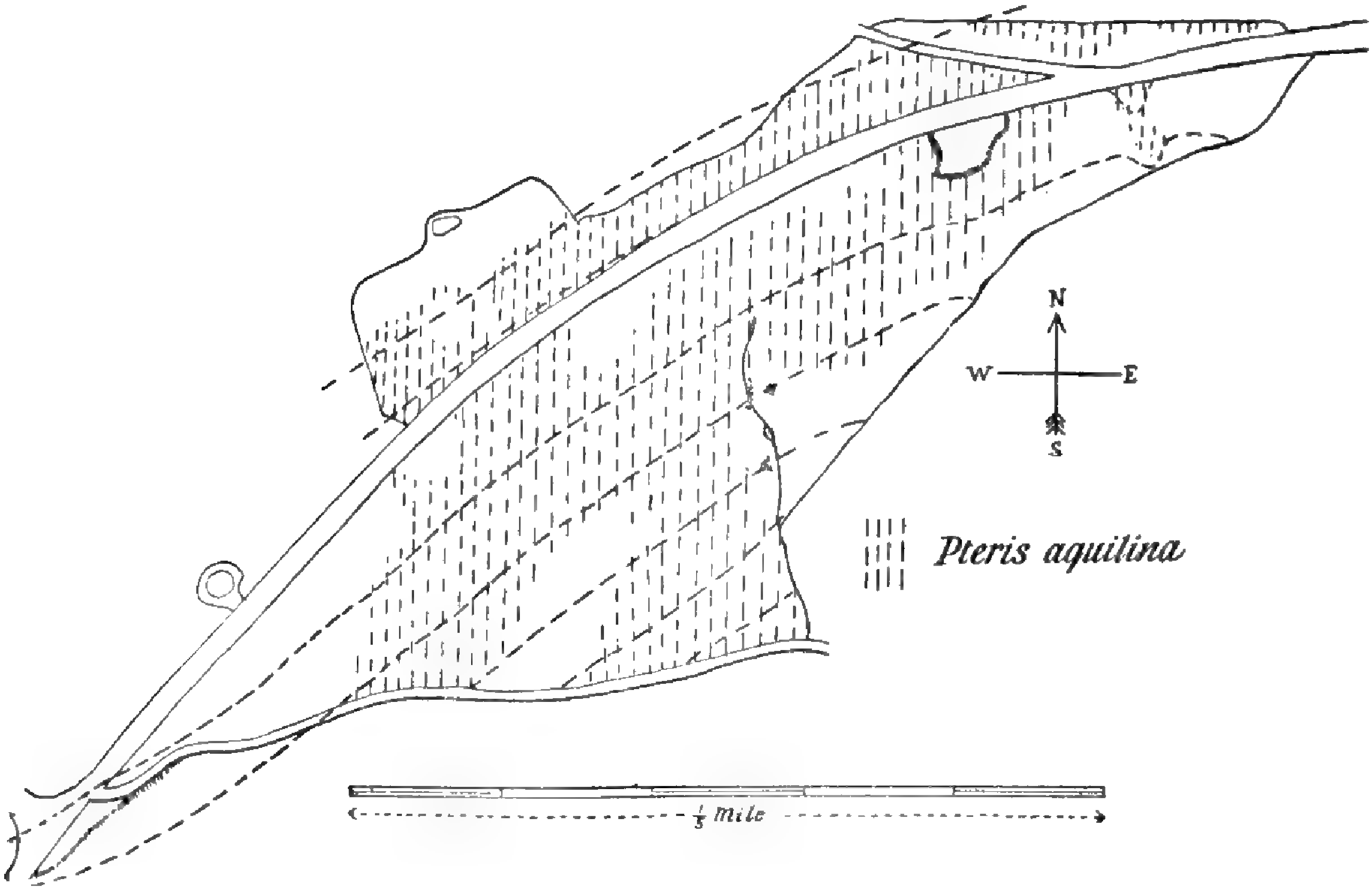
Birks Wood.
Map showing the distribution of Trees.

Thirty years ago little or no Bracken occurred here, but at that time there was an extensive shrubby undergrowth, especially of Hazel. The depredations of rabbits, however, was such as to practically exterminate the shrubs, and the increased light thus admitted favoured the development of Bracken, until at the present time its distribution is limited, as shown in fig. 2. Similar changes have taken place over extensive areas in the adjoining Woodsome Woods.

Another interesting illustration of the effect of trees on the distribution of plants is found in the Woods at Honley.

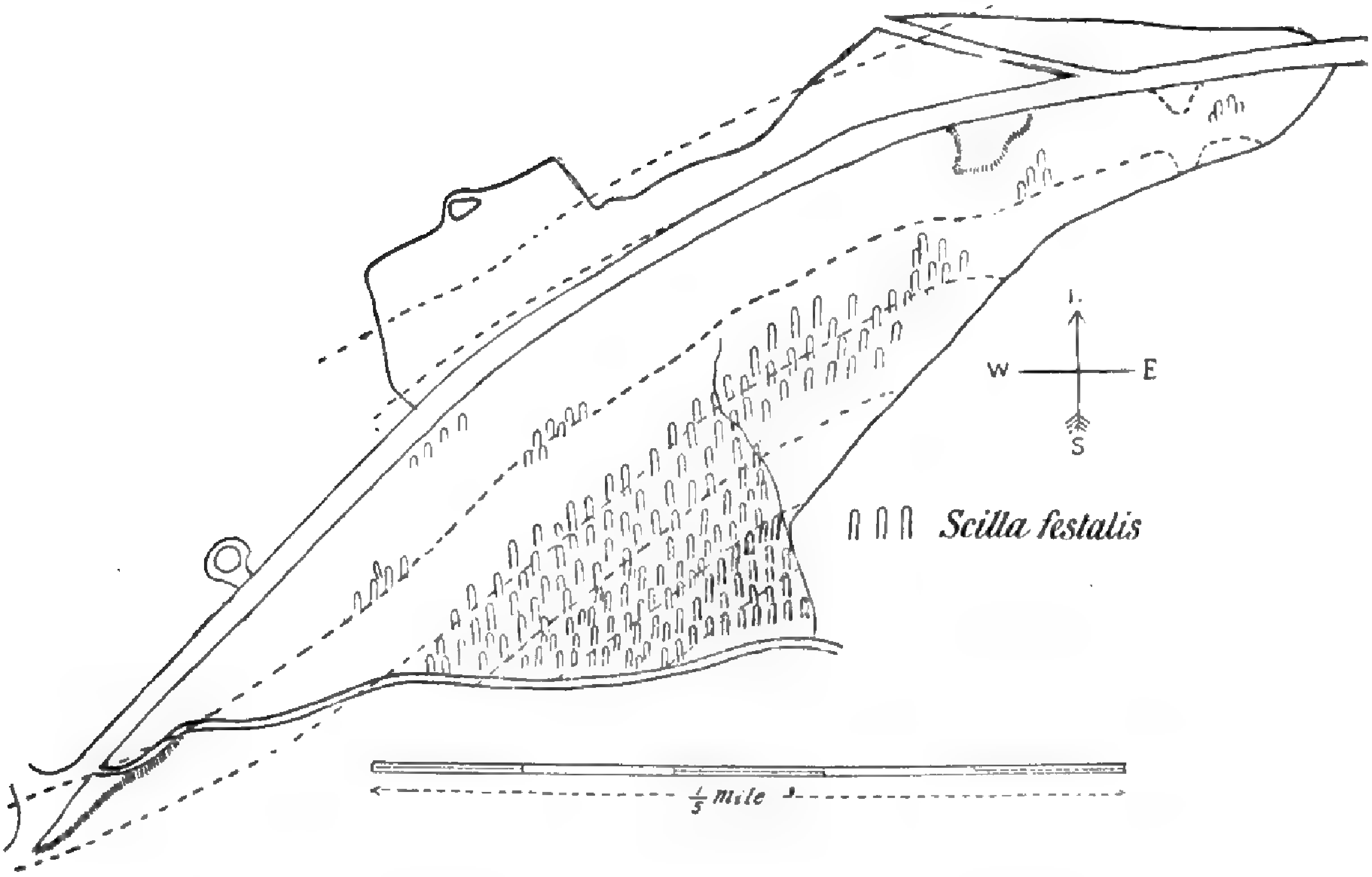
Twenty years ago the thickly planted Pines produced such a dense shade that the ground beneath was practically devoid of vegetation, the deep shade favouring the accumulation of considerable humus. Since then, thinning has taken place in a portion of the wood to the west, thus exposing the remaining pines to the prevailing winds. This, together with the ravages made by the pine-bark beetle and some felling of the pines, has gradually admitted light, thus favouring the development of Bracken. It has made inroads from the adjacent wood, slowly pushing its way, until at the present time it forms a dense sheet in the

Fig. 2.



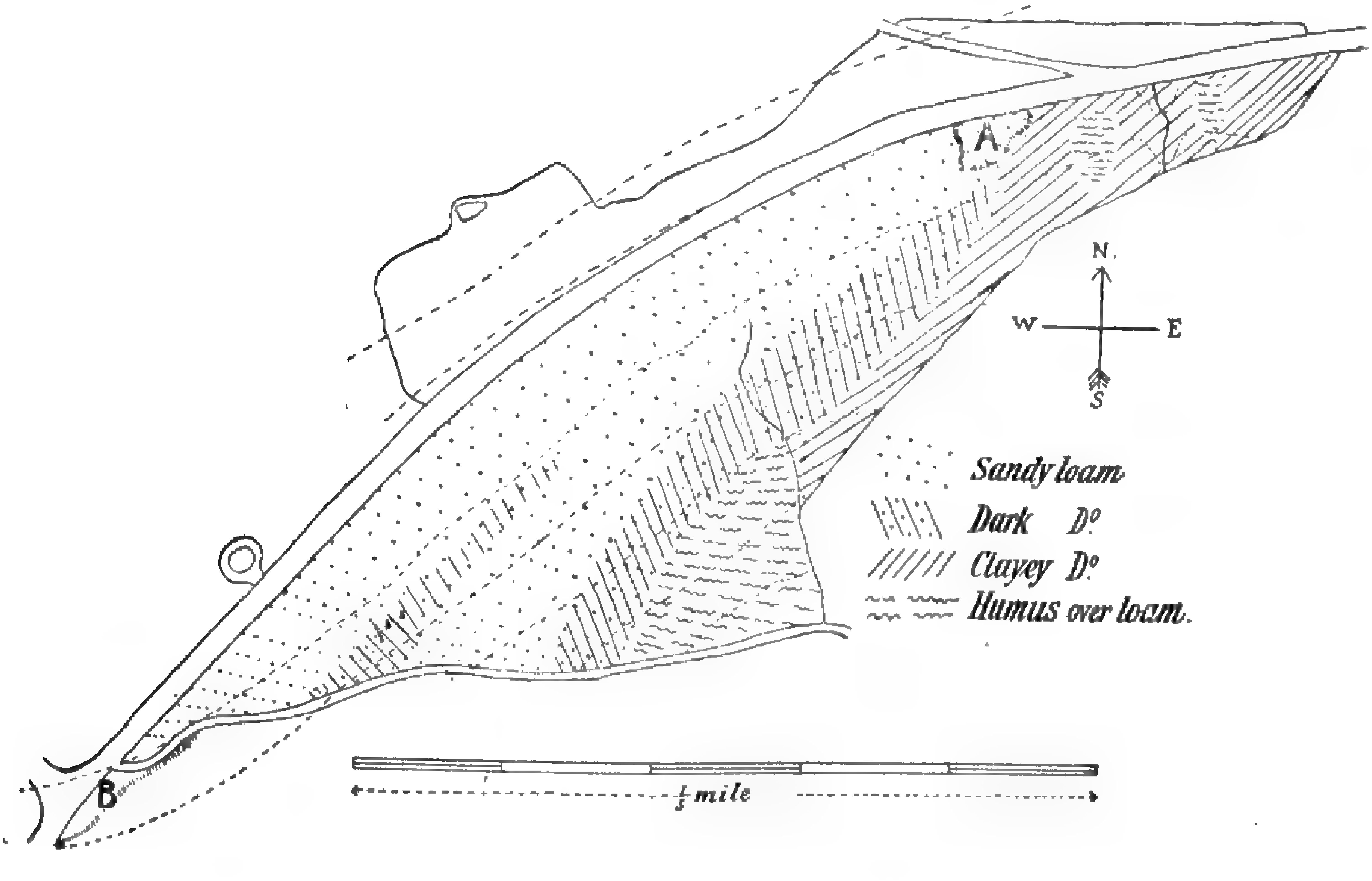
Birks Wood.
Map showing the distribution of *Pteris aquilina*, Linn.

Fig. 3.


N
W
E
S
Scilla festalis
$\frac{1}{5}$ mile

Birks Wood.
Map showing the distribution of *Scilla festalis*.

Fig. 4.


A
B
N.
W
E
S
Sandy loam
Dark D°
Clayey D°
Humus over loam.
$\frac{1}{5}$ mile

Birks Wood.—Soil Map.

lighter part of the wood, thinning out under the deeper shade of the less injured pines.

The Bracken must have long been a characteristic plant in this zone, as the peat, in places a foot in thickness, consists so extensively of the remains of this plant that we might fairly call it Bracken peat.

It has, as associates, the xerophytes of the plateau, *Deschampsia flexuosa, Calluna Erica, Vaccinium Myrtillus*, &c.

We will now apply this method to another species.

Fig. 3 shows the distribution of *Scilla festalis* in Birks Wood. Here we see that its occurrence is only partially influenced by the dominant trees. It is abundant under Sycamore and Oak in certain areas, thinning out in others. Light was evidently not the only factor, so other conditions were examined. In certain parts of the wood, changes of soils being pretty well marked, an attempt was made to construct a soil-map. In fig. 4 we have the result. The details were obtained by means of an augur 1½ inch in diameter and with a 6-inch thread to which iron rods were screwed. A similar borer is figured by Hall (43). The area was paced and borings made at intervals of 10 yards. The sketch-map was ruled in corresponding squares and results added*. As will be seen, the soil along the northern half of the wood consists of a shallow sandy loam resting on a bed of Elland flagstone quarried at the two extremities A and B. This area therefore is well drained, relatively dry, and the soil covered with only a thin layer of sandy humus; while the soils over the rest of the area consist of firmer, more clayey loam resting on a bed of clay, and in the parts indicated it is covered by 6 inches or more of humus. The well-known spongy properties of humus, coupled with the fact that such fine-grained soils as occur here are able not only to retain, but even raise water above the underground level, renders this area relatively moist.

On comparing this with the *Scilla* map, it will be seen that the plant is most abundant in a loamy soil covered by six inches or more of humus. The overshadowing trees are Oak with a considerable admixture of Sycamore, and it is thus an area of moderate shade. Along the northern edge of this the humus is very thin, on a dark sandy loam, the trees are Elm and Beech, and notwithstanding the deep shade of the latter the plant is still common. To the north-east humus is absent altogether, the soil consisting of a clayey loam resting on stiff clay, becoming slightly more sandy, with humus in patches to the extreme east. In the stiff clayey soil the Bluebell distinctly thins out, and here it competes with Yellow Dead-nettle (*Lamium Galeobdolon*), Dog's Mercury (*Mercurialis perennis*), and *Arum maculatum*, together with numerous root-branches of small trees, between which the bulbs of *Scilla* are often tightly packed, though they not uncommonly escape this competition by penetrating more deeply in spite of the stiffness of the soil. Another determining factor is the deep shade of the trees in this area, consisting of Beech, Elm, Sycamore, and Elder. The remainder of the wood to the north and west has a shallow sandy soil mixed with humus, there being little or no humus as a distinct layer on the surface, hence its power of holding water is greatly reduced. This soil lies immediately above a bed of Elland flagstone quarried at A and B (fig. 4). In this area *Scilla* only occurs in small straggling patches. Its chief competitor here

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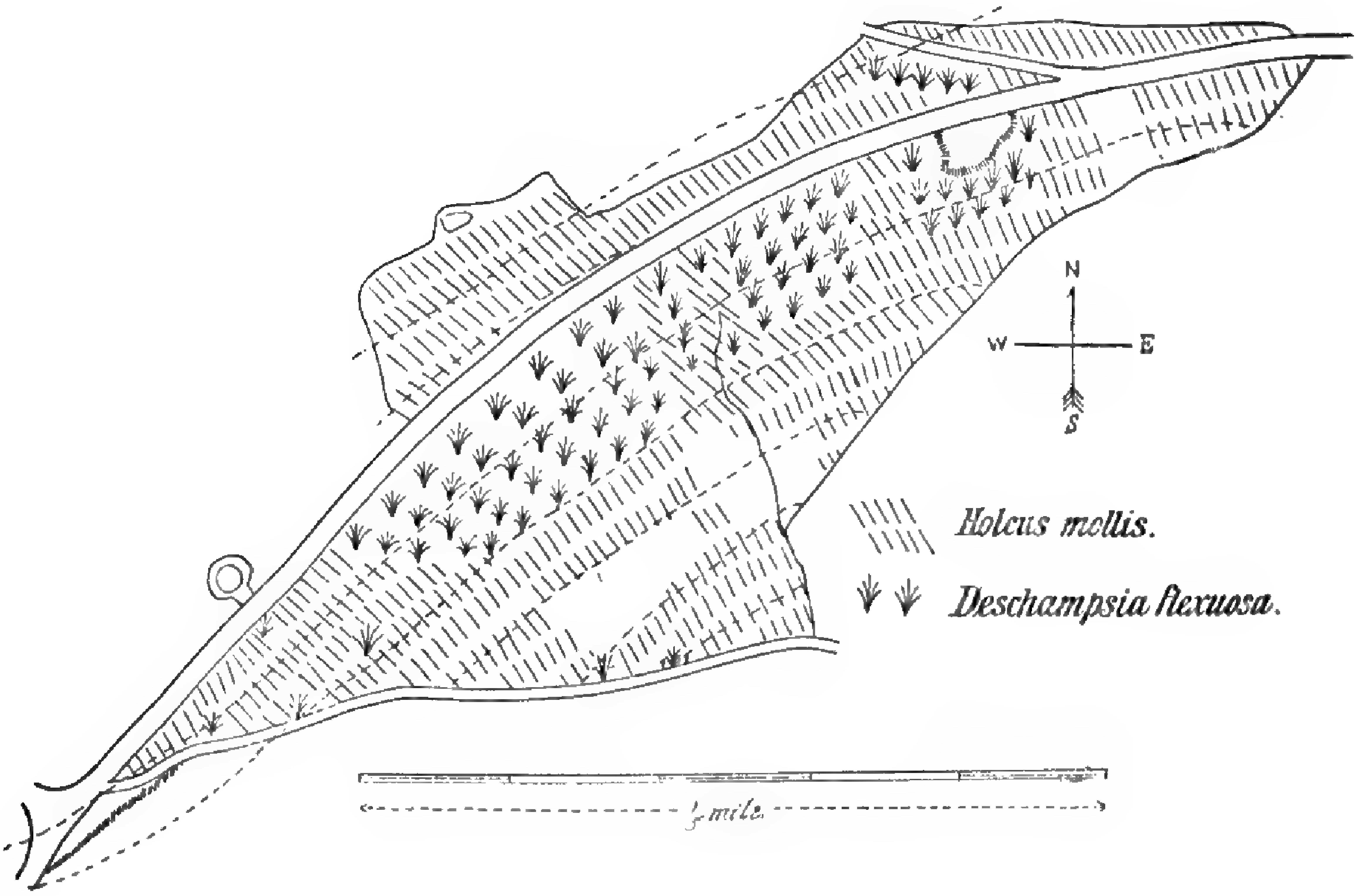
* Oliver & Tansley (75) have recently given an interesting account of a method of surveying vegetation by means of squares, adopted by them in the survey of the Bouche d'Erquy.

Fig. 5.



Birks Wood.
Map showing the distribution of *Holcus mollis* and *Deschampsia flexuosa*.

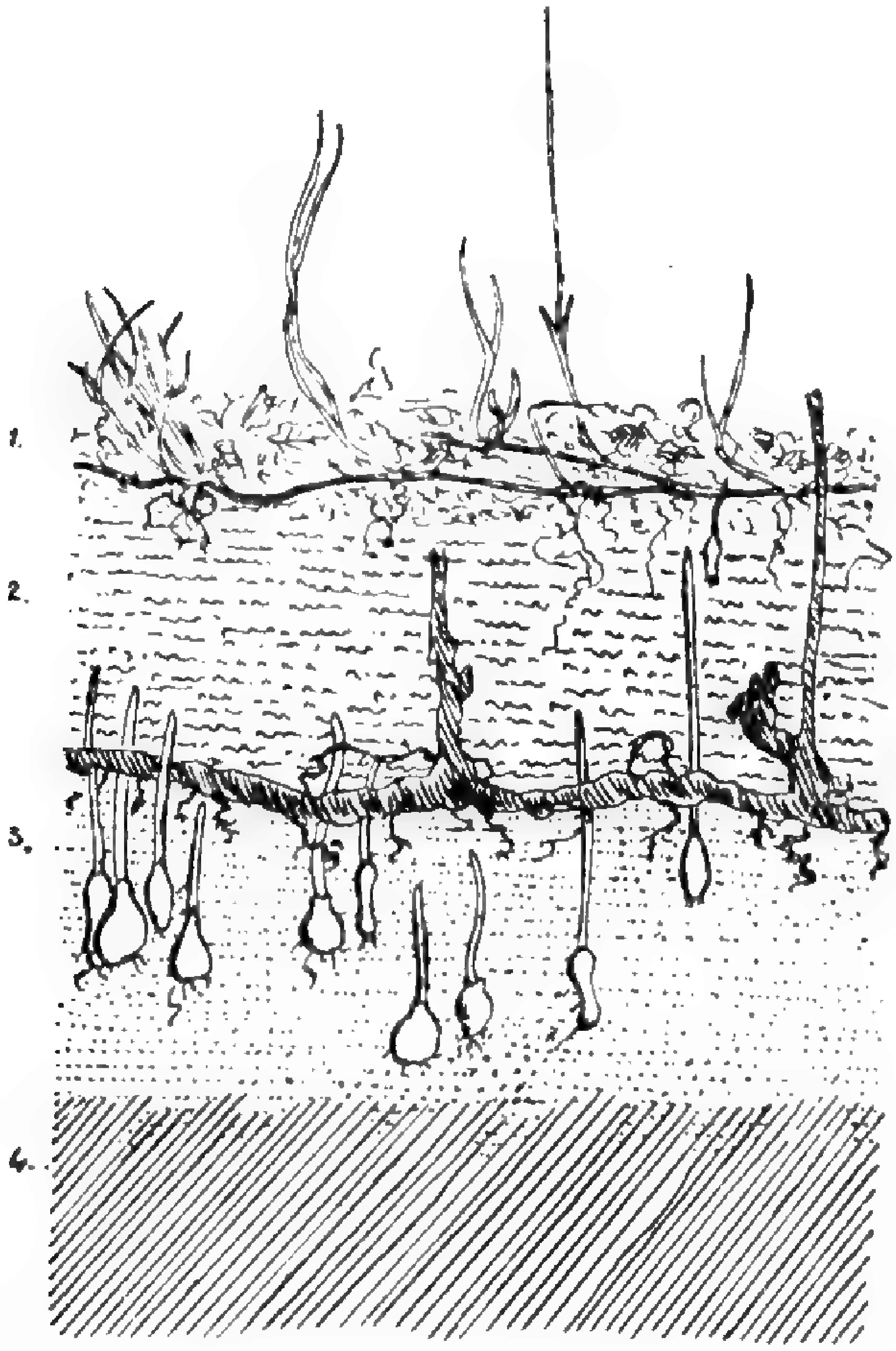
is *Deschampsia flexuosa*, the dense, dry, wiry tussocks of which form an unfavourable medium for the germination of the seeds of *Scilla*; and although the two species are frequently found together, *Scilla* very rarely forms those unbroken sheets so characteristic of the moist areas and when associated with *Holcus mollis*. The thinning-out of this species in woods with a very shallow sandy soil, as in many of the woods in the gritstone area, is very striking.

A comparison of the soil-map with the bracken-map shows that a change of soils and accompanying conditions do not offer here a barrier to this species.

Fig. 5 shows the distribution of common grasses. The grass vegetation is composed mainly of two species. In the moister parts, where the soils consist of fairly thick humus over loam, is *Holcus mollis*. In the drier parts to the north, especially where the ground is in rounded mounds with shallow, well-drained, sandy soil mixed with humus, *Deschampsia flexuosa* dominates. Along with this are scattered such xerophytes as *Galium saxatile*, Linn., *Vaccinium Myrtillus*, Linn., *Calluna Erica*, DC., and *Teucrium Scorodonia*, Linn. Here and there *Holcus* makes deep inroads into this area, occupying chiefly the moister humus-covered hollows.

It will be seen, on comparing maps 2, 3, and 5, that *Holcus mollis*, Bracken (*P. aquilina*), and Bluebell (*S. festalis*) often occupy the same area and appear to be in competition with each other, but closer examination shows this is not the case. We have here a well-marked society or sub-association, the species of which are admirably adapted to each other's requirements. *Holcus* is a surface-plant (fig. 6, p. 344), its long rhizomes running in the loose leaf-mould, as may be determined by the ease with which it is uprooted. Beneath this in the deeper humus are the rhizomes of the Bracken, often running along the upper surface of or just within the loam, forming a distinct Bracken layer, the decay of its fronds contributing an annual quota for its higher associates; while in the firm loam below are the bulbs of *Scilla*, though often we find in the *Holcus* and Bracken layers young bulbs on their way downwards. Their soil requirements, their modes of life, their periods of active vegetative growth, their times of flowering and fruiting, are for the most part different. The unbroken sheets of blue when *Scilla* is in flower in early spring, followed in the summer by equally continuous sheets of *Pteris*, form the most striking features in the woodland vegetation of this district. Thus, in many respects, each species is not within the sphere of influence of the other, and they flourish accordingly. Competition such as it is goes on between individuals of the same species. When, however, *Pteris* increases in density, the tendency is to markedly reduce the flowering activity of *Holcus*. Its tips early show signs of withering, its period of vegetative growth is limited, and eventually its distribution becomes stricted. In the late winter and early spring, however, it grows apace and makes great headway before the Bracken develops.

Fig. 6.



Vertical Section of Soil in dense *Scilla* area : *Holcus*, *Pteris*, and *Scilla* layers.

The chief elements in the Meso-pteridetum of the moist Coal-Measure Oak Woods, showing their relations to each other in the soil.

These observations support those of Areschoug (1), Rimbach (81), P. E. Müller (72), and others, a very useful summary of whose work has been given by Oliver (74), and more recently, with further interesting results, by Massart (65).

This association or Meso-pteridetum is very characteristic of the moist Coal-Measure Oak woods in the West Riding of Yorkshire, and forms what we may call a *complementary association*; the subaerial parts, as we have seen, are edaphically complementary, the aerial parts being seasonally complementary.

Macdougal (62) recently made a study of temperatures at different depths, with the view of showing the extremes to which the different parts of plants are subjected, and found a considerable range. He records that in New York during the months of October, November, and December, 1902, the ground was at times frozen at a depth of one foot. Mr. Charles Brook has kindly supplied me with readings for a corresponding period taken by him at Harewood Lodge, Meltham, which will serve to indicate the variations in this district. Rarely is the ground frozen here to a depth of a foot, but this, however, did occur in February 1895, when the ground was frozen to a depth of 20 inches for 13 days. Probably not since 1809 has so low a temperature been recorded here. Maximum temperatures on the grass were not taken, but I give the maximum and minimum at 4 feet above the grass.

The relatively slight variations seen to occur at one foot, and still less at two feet, below the surface will obviously be an advantage to deep-rooted plants, especially to those vegetating early in the year. In this connection it is interesting to note that of the three plants of this association, the first to make its appearance (*Scilla festalis*), and therefore most likely to be injured by early frosts on account of its early vegetative growth and flowering, is the one most deeply rooted and also, as we shall see, possesses for all practical purposes an unfreezable sap.

Temperatures (° F.) recorded at Harewood Lodge, Meltham.
Altitude 510 feet.

Absolute monthly maximum and minimum temperatures at 4 feet above the grass.

1902.							1903.					
June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	
79·9	76·3	70·0	73·5	60·9	54·9	54·8	51·7	54·9	62·0	58·7	75·9	Max.
33·0	37·4	38·7	34·2	33·0	27·9	16·4	18·0	29·8	30·5	26·6	32·0	Min.
46·9	38·9	31·3	39·3	27·9	27·0	38·4	33·7	25·1	31·5	32·1	43·9	Diff.

Absolute minimum temperatures recorded on the grass.
Maximum temperatures not taken.

27·0	32·3	32·5	28·9	27·5	20·1	14·1	16·0	23·7	23·0	18·7	27·0

Maximum and minimum temperatures recorded at 9 A.M.
One foot below the grass.[*]

1902.							1903.					
June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	
60·7	60·1	56·2	57·2	51·2	47·8	43·2	40·8	43·5	44·7	44·8	53·6	Max.
49·7	54·0	53·1	50·5	46·3	38·7	36·0	34·5	37·7	38·6	39·2	43·8	Min.
11·0	6·1	3·1	6·7	4·9	9·1	7·2	6·3	5·8	6·1	5·6	9·8	Diff.

Maximum and minimum temperatures recorded at 9 A.M.
Two feet below the grass.[*]

59·0	58·7	55·5	55·9	51·3	47·9	43·5	40·5	43·5	44·2	44·5	52·4	Max.
49·2	53·9	53·4	51·2	47·3	40·7	38·0	35·7	38·7	39·6	40·8	44·6	Min.
9·8	4·8	2·1	4·7	4·0	7·2	5·5	4·8	4·8	4·6	3·7	7·8	Diff.

For purposes of comparison, woods in other parts of the district were examined and similar maps prepared on the same scale; these were Molly Carr Woods and Haigh Spring Wood in the Coal-Measure Area, and Armitage Bridge Woods, Honley Woods, and Hagg Wood, on the edge of the Millstone-Grit Plateau. These gave the same results, except that in some areas indicated as Sandstone on the Geological Map it was found, on examining the soils, that these beds were overlaid in great part by moist clayey loam and considerable humus, and not by a dry sandy soil as in Birks Wood. The trees, too, in these parts of the woods are frequently shade-trees, hence in areas which from a Geological map might be expected to produce xerophytic grasses and their associates, the ground was dominated by mesophytes. These features occur not uncommonly throughout the Coal-Measure area. The detailed study, even of a small area, shows the importance, not only of the edaphic influences in determining the composition of the flora, but also that the distribution of the dominant species is the result of many interacting and complex forces.

[*] These do not represent absolute Maxima and Minima; the readings are taken at 9 A.M., which is the coldest hour of the day for Earth Temperatures. In the six summer months the absolute Maxima are perhaps one or two degrees higher; the Minima are probably not far from absolute Minima. In some respects the results are unusual. February and March were both very mild months, and April was abnormally cold, so that it was actually a trifle colder than both the preceding months.

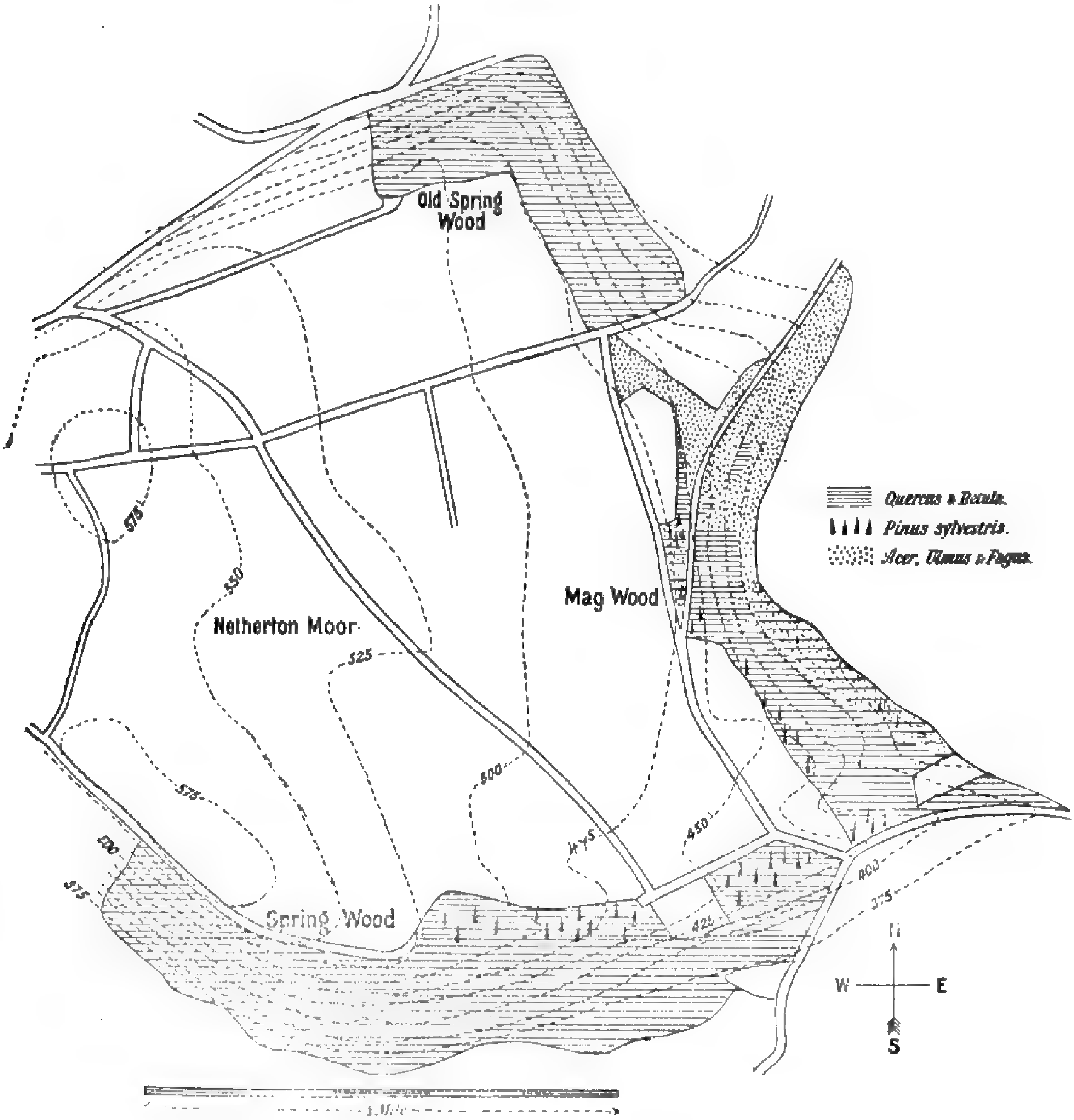
b. *A typical Mixed Deciduous Wood of the Plateau and Slopes of the Millstone-Grit Area.*

Figs. 7 and 8 (pp. 348, 349) of Armitage Bridge Woods illustrate the characteristic features of the woods skirting the edge of the Gritstone Plateau.

The three portions of this woodland are known by distinctive names, as is common in the woods of the district generally. They surround that portion of the plateau known as Netherton Moor, cut off from the main tableland by the stream in Dean Clough to the north, by Mag Brook to the south, this stream joining the River Holme, which forms the eastern boundary. The plateau is under cultivation, but skirting the margin and covering the slopes are the relics of the primitive vegetation. As shown by the contour-lines, the altitude at the edge of the plateau is 550 feet. It then suddenly drops to 375 ft., or about 2 in 5. The upper portion has a very shallow sandy soil covered with a thin layer of peat, and succeeded below by shales and clays overlaid with deeper moister soils. The distribution of trees is shown in fig. 7. In Old Spring Wood and Spring Wood the dominant tree is Oak, with an admixture of Birch and Pine, and while Oak is the dominant tree in Mag Wood, areas to the north and east are occupied by shade-trees, Sycamore (*Acer Pseudo-platanus*, Linn.), Elm (*Ulmus montana*, Stokes), and Beech (*Fagus sylvatica*, Linn.). The characteristic plants of the undergrowth are shown in fig. 8, and they are *Deschampsia flexuosa*, *Pteris aquilina*, *Calluna Erica*, *Vaccinium Myrtillus*, and *Holcus mollis*. A reference to this map will show clearly the effect on the vegetation of the changed conditions in a very short distance. While the distribution of Bracken seems to be limited to a large extent by the shade-trees, obviously other factors come into play to limit its distribution in the Oak areas. In the higher parts of the wood, where the soil is shallow, sandy, and covered with a thin layer of peat, Bracken occurs in patches and is in competition with Ling and Bilberry; their rhizomes must of necessity occupy practically the same layer, and frequently we find them interlacing. Here we have a Xero-pteridetum, the elements of which are not complementary; they form what we may term a competitive association, sometimes one, sometimes the other species dominating. Below this is a transition region, from the sandstones to the shales and clays;

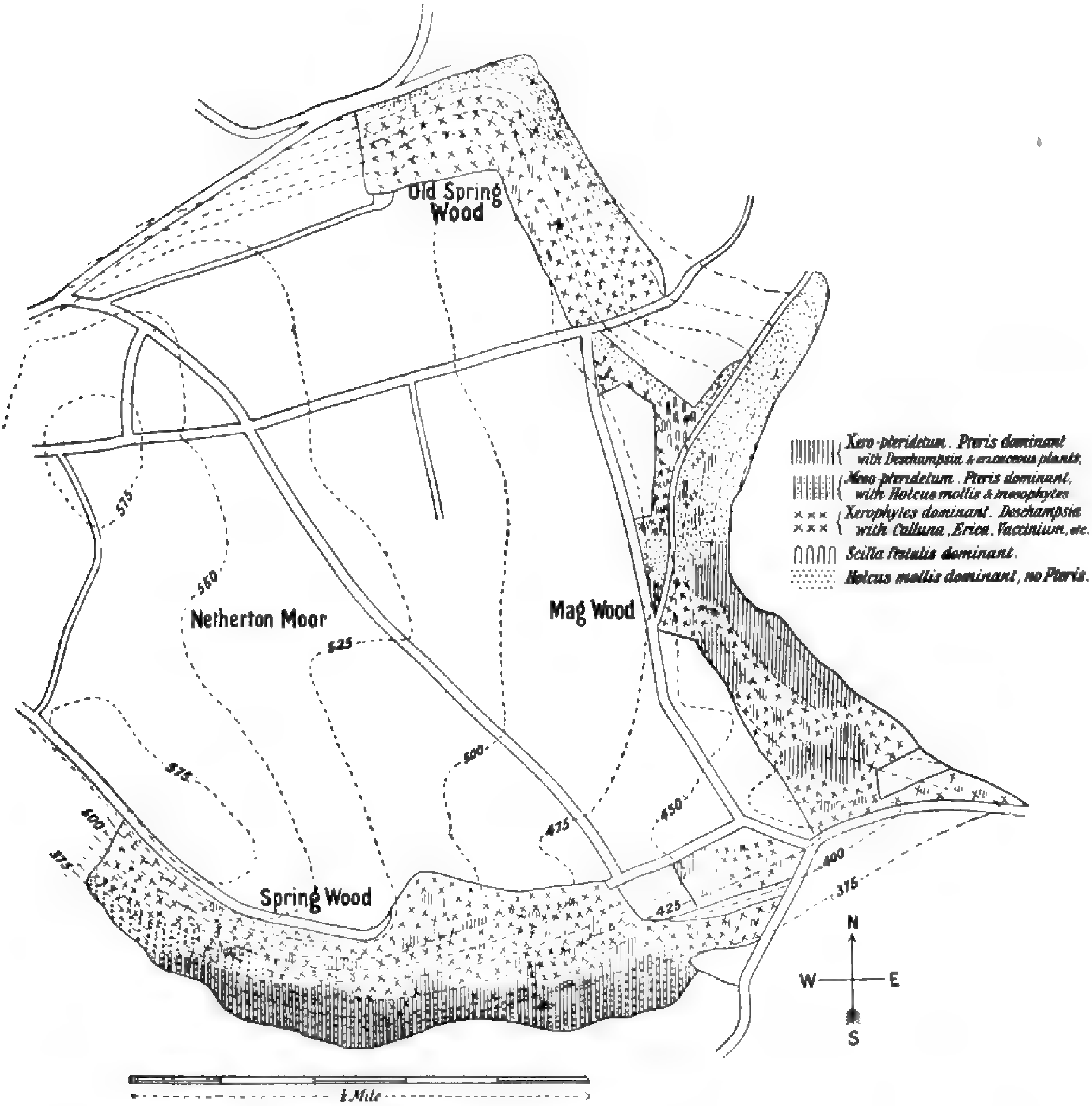
the steep slopes are covered with fallen blocks of stone, the soil contains a considerable admixture of sand and is well drained and relatively dry. The Xerophytes are thus carried over the shales a considerable distance, thinning out in the moister lower parts of the wood. Here, in deeper soil, Bracken no longer

Fig. 7.


Old Spring Wood
Mag Wood
Netherton Moor
Spring Wood
Quercus & Betula.
Pinus sylvestris.
Acer, Ulmus & Fagus.
575
550
525
500
475
450
425
400
375
N
W
E
S
½ Mile

competes with rhizomatous plants, and thus forms an unbroken sheet with mesophyte associates, e.g. *Holcus mollis*, *Scilla festalis*, *Lamium Galeobdolon*, &c., a complementary association or Meso-pteridetum. This is well seen in Spring Wood. In Mag Wood, where the soil conditions are favourable to the development of Bracken, it is, except for a few patches, cut out to the north by deep shade. Here, with deeper humus and therefore with increased moisture, the tendency is for the Mesophytes to ascend above the limit of the shales, and in the area indicated, where normally we might expect a xerophytic undergrowth, the deep shade of the beeches is such that *Scilla* (a very attenuated form) is the only plant in possession of the ground.

Fig. 8.


Old Spring Wood
Netherton Moor
Mag Wood
Spring Wood
575
550
525
500
475
450
425
400
375
N
W
E
S
Xero-pteridetum. Pteris dominant with Deschampsia & ericaceous plants.
Meso-pteridetum. Pteris dominant, with Holcus mollis & mesophytes
Xerophytes dominant. Deschampsia with Calluna, Erica, Vaccinium, etc.
Scilla festalis dominant.
Holcus mollis dominant, no Pteris.
½ Mile

Old Spring Wood has been greatly disturbed by quarrying operations &c., but in spite of great interference by man the dominant plants are those characteristic of the plateau.

Distribution of Dominant Woodland Trees and Plants of the Undergrowth in the Huddersfield District.

Having determined some of the chief factors influencing the distribution of woodland plants in typical areas, it remained to extend the observations over a wider area, and so discover to what extent the results were capable of more general application. Consequently similar observations were carried on over an area of 66 square miles and the results recorded on maps of 6-inches to the mile scale.

This area is included in sheets 259 N.E. and S.E. 260, 261 N.W. and S.W., 271 N.E., and 272 N.W. and N.E. of the 6-inches to the mile Ordnance-Survey maps.

The two maps (figs. 9 & 10, pp. 352–3) show these details on a greatly reduced scale. This reduction, however, made it impossible to indicate the many small details studied; this will be easily understood if they are compared with the sketch-maps, figs. 1–5 and 7 & 8 *. The map (fig. 9) shows the distribution of the dominant trees, viz.:—Coniferous trees, chiefly *Pinus sylvestris*, Oak (*Quercus Robur*, Linn.), and Birch (*Betula verrucosa*, Ehrh.); and shade-trees, chiefly Sycamore (*Acer Pseudoplatanus*, Linn.), Elm (*Ulmus montana*, Stokes), and Beech (*Fagus sylvatica*, Linn.). Areas are also indicated where trees occur buried in peat, these are chiefly Birch.

On comparing this with the undergrowth map (fig. 10) we see that the area covered by trees is relatively limited, while that covered by plants which are common in the undergrowth of the woodlands is much greater, especially to the west—*i. e.*, species like Bracken (*Pteris aquilina*, Linn.), *Deschampsia*, Ling (*Calluna Erica*, DC.), and Bilberry (*Vaccinium Myrtillus*, Linn.) cover large tracts in a comparatively treeless region. We also see that while Bracken is absent commonly under shade-trees, it is not infrequently found there, and, on the other hand, it is not uncommonly absent under trees with an open canopy.

The distribution of *Vaccinium Myrtillus* is very interesting, especially when considered in the light of observations on its distribution elsewhere and the history of the vegetation in this district. It is primarily a humus plant, and its distribution depends on the presence of humus. As I have previously shown (109), and as Stahl (93) has since independently observed, the plant has Mycorhiza on its roots. Stebler & Volkart (94), in their study of the "Matten und Weiden der Schweiz," made a statistical analysis of the species composing the several formations there, together with the influence of shade on their distribution. With reference to the occurrence of this species, they say: "Im Tieflande in Wäldern, in den Alpen im lichten Alpenwalde." We also find it in such situations in the Huddersfield district, but we see, on reference to the map (fig. 10), that there is a very considerable development also in open moorland areas outside our present woodlands. In Switzerland, however, it avoids the open sunny situations to such an extent that Stebler & Volkart apply to it the term "lichtfürchtend." This, however, seems too sweeping, for on p. 29 of the same contribution they say "Sie kommen in den Alpen im Freien vor, weil hier die Bildung des ihnen unumgänglich notwendigen Humus unter günstigen Bedingungen auch im Freien stattfindet." Still, as I have also observed, in Switzerland and elsewhere it reaches its greatest development in the open woods. In this connection, the observations of Wiesner (107) are of interest. In a brief reference to the dwarf form of this species (mentioned below, p. 388) which he often found in the Yellowstone district of North America, he says it occurred "in der Höhe von Thumb Bay im Schatten des Waldes und ich verfolgte es so weit, bis es zu verkümmern begann, also das Minimum des Lichtgenusses aufsuchte, welches ich $= \frac{1}{16.6}$ gefunden habe." It is very characteristic of the species in the Huddersfield district to avoid the deep shade of the sycamore-elm-beech woods, even though the necessary humus is available.

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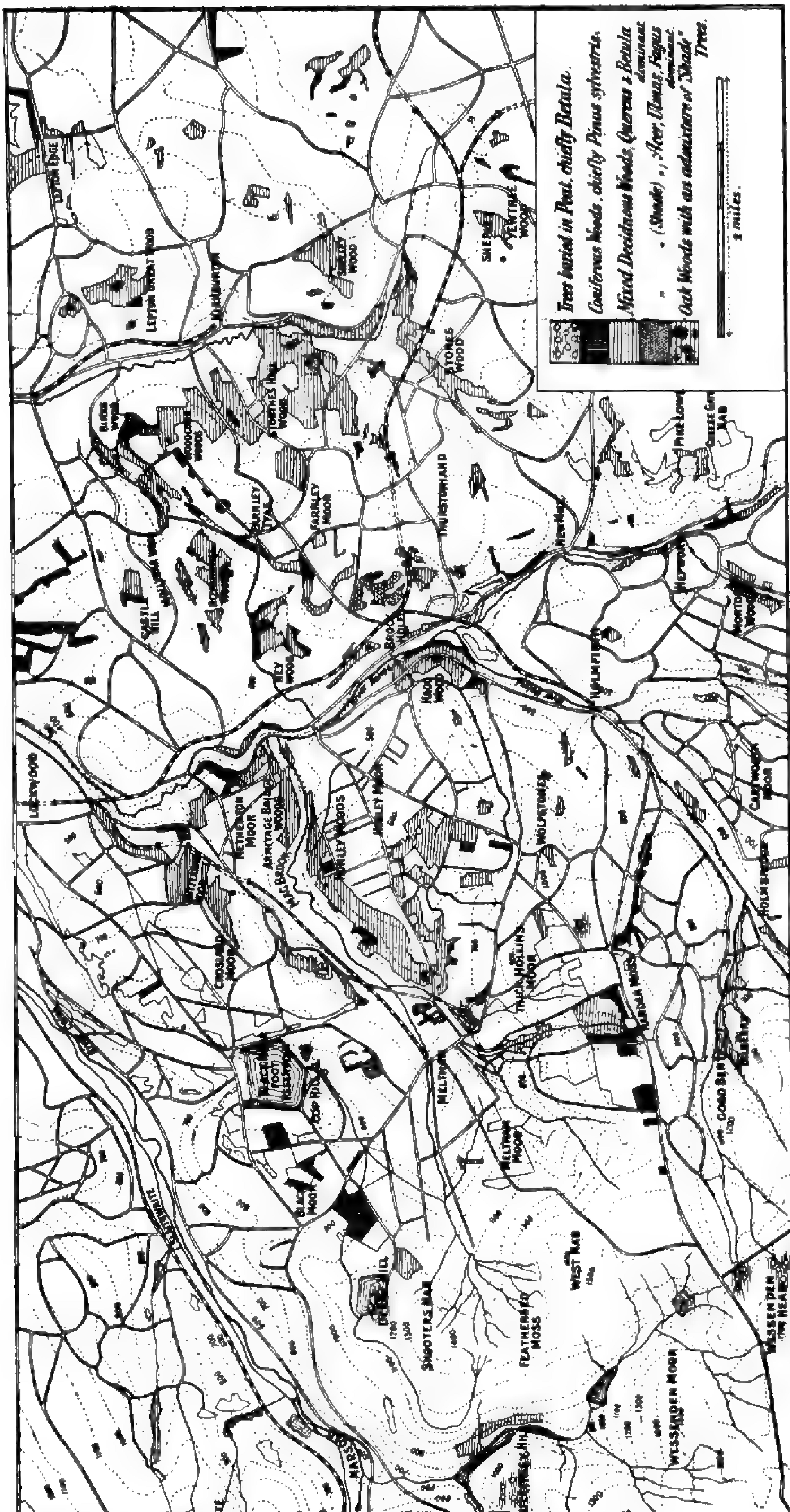
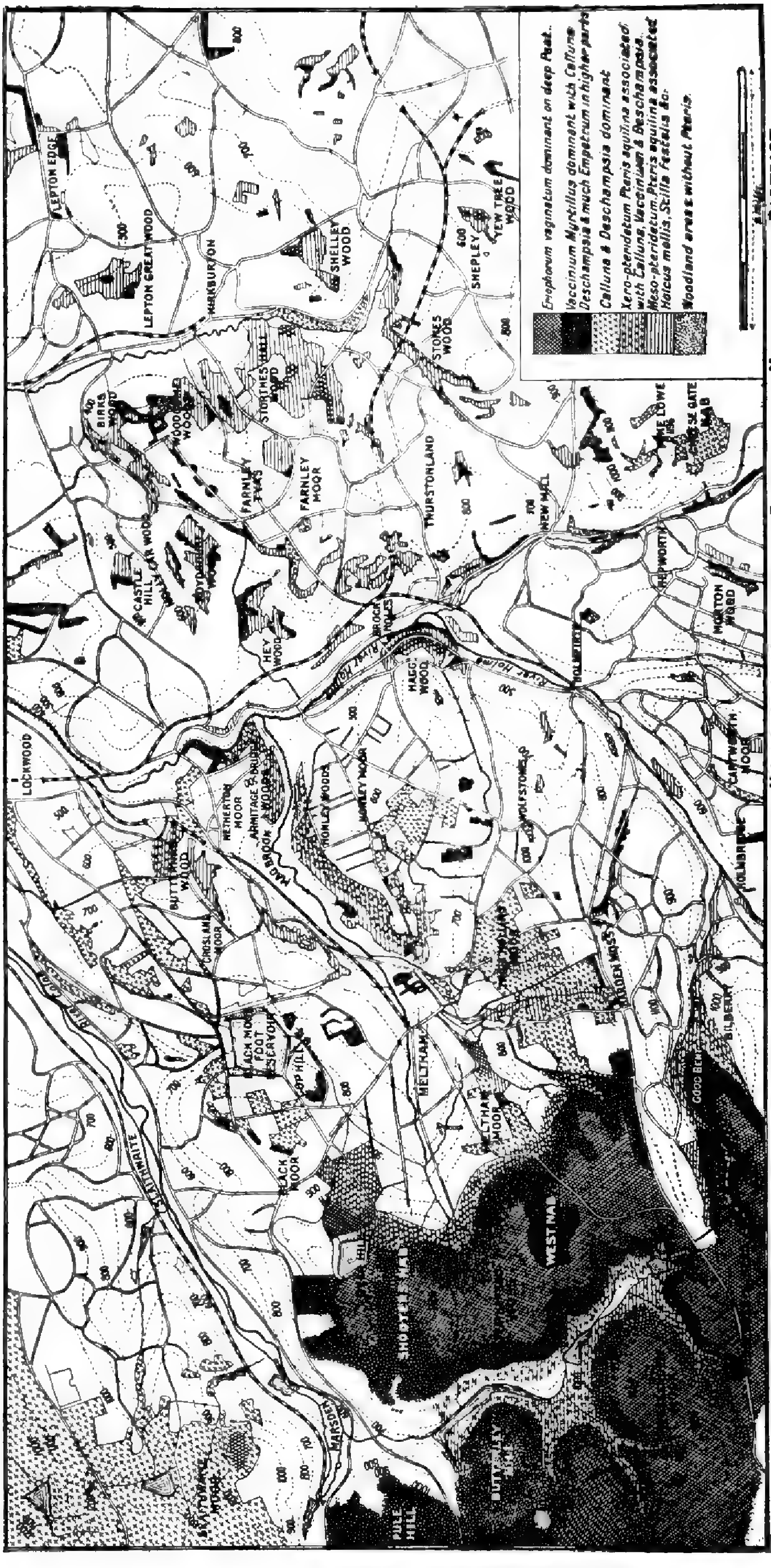
* In working out these details in the field I found it necessary to have a number of duplicate maps on which to record preliminary observations and build up the facts. To avoid the cost of many Survey Maps, tracings of the necessary areas were prepared and these were used as "negatives" from which the required number of prints were made on Thornton's Universal Photo-paper; these proved very useful.

In view of the considerable evidence of the former occurrence of forest on the Moors of the Huddersfield district, as indicated below, can it be that its present distribution represents, to some extent at any rate, the position of previous open forest? In this connection successful attempts have been recently made, by Flahault (31), Eblin (27), Schröter (84), and others, to determine the limit of previous forest by means of the present distribution of species typically occurring in woods, and, as Früh and Schröter (32) have pointed out, extensive deposits of peat nowhere occur outside the tree limit.


Trees buried in Peat, chiefly Betula.
Coniferous Woods, chiefly Pinus sylvestris.
Mixed Deciduous Woods, Quercus & Betula dominant.
" " (Shade) " ; Acer, Ulmus, Fagus dominant.
Oak Woods with an admixture of "Shade" Trees.
2 miles.
LEPTON EDGE
LEPTON GREAT WOOD
KIRKBURTON
SHELLEY WOOD
SHEPLEY
YEWTREE WOOD
STONES WOOD
STORTHES HALL WOOD
BUCK WOOD
WOODSOME WOODS
FARNLEY TYAS
FARNLEY MOOR
THURSTONLAND
CASTLE HILL
DOGLEY WOOD
NEW MILL
HEPWORTH
HONLEY
NETHERTON MOOR
ARMITAGE BRIDGE WOODS
HONLEY WOODS
HONLEY MOOR
WOLFSTONES
LINDLEY WOOD
CROSLAND MOOR
BLACKMOORFOOT RESERVOIR
CROSLAND HILL
MELTHAM
MELTHAM MOOR
THICK HOLLINS MOOR
HOLMFIRTH
CARTWORTH MOOR
HOLMBRIDGE
GOODBENT
WEST NAB
DEER HILL
SHOOTERS NAB
FEATHERBED MOSS
WESSENDEN HEAD
WESSENDEN MOOR
MARSDEN
PULE HILL
SLAITHWAITE MOOR
PIKE LOWE
CHEESE GATE NAB

9. MAP shewing the DISTRIBUTION of the DOMINANT TREES in the HUDDERSFIELD DISTRICT.


Eriophorum vaginatum dominant on deep Peat.
Vaccinium Myrtillus dominant with Calluna Deschampsia & much Empetrum in higher parts
Calluna & Deschampsia dominant
Xero-pteridetum Pteris aquilina associated with Calluna, Vaccinium & Deschampsia.
Meso-pteridetum Pteris aquilina associated Holcus mollis, Scilla Festuca &c.
Woodland areas without Pteris.
2 Miles
LEPTON EDGE
LEPTON GREAT WOOD
KIRKBURTON
SHELLEY WOOD
SHEPLEY
YEW TREE WOOD
STORES WOOD
STORTHES HALL WOOD
BIRKS WOOD
FARNLEY TYAS
FARNLEY MOOR
THURSTONLAND
NEW MILL
THE LOWE
CASTLE HILL
HEY WOOD
BROCKHOLES
HAGG WOOD
HEPWORTH
MORTON WOOD
HOLMFIRTH
LOCKWOOD
NETHERTON MOOR
ARMITAGE & DRUM WOODS
HONLEY WOODS
HONLEY MOOR
WOLFSTONES
CARTWORTH MOOR
HOLMBRIDGE
BUTTERNAB WOOD
CROSLAND MOOR
BLACK MOOR FOOT RESERVOIR
COP HILL
MELTHAM
MELTHAM MOOR
BLACK MOOR
GOOD BENT
BILBERRY
WEST NAB
SHOOTERS NAB
BUTTERLEY
PULE HILL
MARSDEN
SLAITHWAITE
MAG BROOK
River Holme
500
600
700
800
900
1000

10. MAP OF THE HUDDERSFIELD DISTRICT SHEWING THE DISTRIBUTION OF UNDERGROWTH & MOORLAND PLANTS IN THE HUDDERSFIELD DISTRICT.

This suggested a more extended examination of soils. The whole area under consideration lies on the Lower Carboniferous formations. Glacial deposits are entirely absent, and, except for deposits of peat to be mentioned below, the soils owe their origin chiefly to the direct denudation of the rocks. Lees (55) has given an interesting account of the "Lithology" of West Yorkshire, giving lists of species characterizing the several soils. In this he follows Thurman (96) and Baker (2), and finds that the soils exert a profound influence on the flora, due largely to their "mechanical" properties and to a much less extent to their chemical composition. Much has of late been written on this subject, an interesting summary of which has recently been given by Solms-Laubach (90). In the present study the works of Roux (82) and Hall (43) have been found very helpful.

Numerous analyses have been made of the soils in the different areas treated of in this paper, but the results are as yet too incomplete to be satisfactorily dealt with here, but they indicate that physical factors, especially those affecting available water, here play a more important part than the chemical, and the question of the influence of lime on vegetation is excluded by the total absence of these deposits in the district.

On the maps (figs. 9 & 10) the various features considered are shown only in the areas not under cultivation, from which it is clearly seen that while the distribution of certain species is influenced profoundly by the dominant tree, other factors are strikingly brought out. The extensive development of *Pteris*, ericaceous plants, and other xerophytes to the west is in remarkable contrast to their relative scarcity towards the east, where, however, they were somewhat better developed formerly than now, their reduction being due largely to cultivation.

The vegetation of this district will be seen to consist of 3 zones, using the term zone in the sense applied by Flahault (30), to indicate the successive stages of vegetation from the base to the summit of a mountain:—

(1) THE MOSS MOOR, which is high, wet, cold, and covered by deep deposits of peat, the dominant plants being cotton-grasses (*Eriophorum vaginatum* and *E. angustifolium*), and the more elevated and drier ridges being clothed with *Vaccinium Myrtillus*, *Empetrum*, &c. Bracken-covered slopes, with xerophytic associates, connect this zone with No. 2.

(2) MILLSTONE-GRIT PLATEAU.—An ericaceous zone of medium

altitude; soils shallow, sandy, dry, in places covered by shallow peat and exposed to the prevailing winds; the dominant plants are xerophytes, such as *Calluna Erica, Vaccinium Myrtillus, Deschampsia*, &c.

(3) Lower Coal-Measure Area.—A lower lying zone with soils deep, often covered by much humus and generally moist; the vegetation less exposed and mesophytic in character. The dominant plants of the undergrowth of the woodlands are *Holcus mollis, Pteris aquilina, Scilla festalis*, &c. If we keep strictly to the geological divisions, we find that the more elevated portions reach upwards of 1100 ft., and have soil conditions and climate favouring the development of xerophytes, and so bringing it within the ericaceous zone.

These three zones correspond nearly, but not quite, to the Moss Moor and the regions of Oat and Wheat cultivation respectively, indicated by Smith & Moss (88). The lower part of the Millstone-Grit plateau lies within the region of Wheat cultivation, while the elevated parts of the Coal-Measure area are in the region of Oat cultivation; though it is interesting to note that here Wheat cultivation is frequent though very much less so than formerly, economic conditions being in no small degree responsible.

As already stated, the rainfall and temperature vary considerably in the three zones, and below are given such observations as are available.

Rainfall.

Records of rainfall for a long series of years are not available for the exact areas required for our purpose; but for a limited period (1890–1901) records are published for several parts of the Moss Moor:—

Wessenden Head......	1270 feet.	45·94 inches.
Harden Moss	1212 „	46·77 „
Deerhill	1149 „	44·77 „
Butterley (11 years) ..	1110 „	41·58 „

No records are available for the higher altitudes.

For the upper part of the Millstone-Grit area, three miles to the east of the Moss Moor, the averages are:—

Blackmoor Foot	800 feet.	42·16 inches.
Meltham Grange	850 „	40·31 „

For the Coal-Measure area the available records are just beyond the northern boundary of our area. Here records have been regularly made for upwards of thirty years. For this period, after deducting the rainfall for abnormal years, the averages are:—

Huddersfield Cemetery....	400 feet.	33·00 inches.
Dalton, Huddersfield	350 „	32·19 „

Although from lack of records these cannot be compared with exactness, they serve to illustrate the fact that of the three regions the Coal-Measure area has the lowest rainfall, and, as stated in a letter to me by Mr. Joshua Robson, "every mile you go westward the total increases." In passing over the Gritstone area the average rises steadily to about 42 inches, while the average to the extreme west on the Moss Moor is over 45 inches, while Lees (55) gives the rainfall of the Pennines generally as about 55 inches.

Mean Temperatures (° F.) at Harewood Lodge, Meltham, in the Millstone-Grit Area.

Altitude 510 feet. Lat. 53° 36′ N., long. 1° 50′ W.

	Jan.	Feb.	Mar.	April.	May.	June.	Year's mean.
At 4 feet above grass...	36·6	37·5	39·7	44·0	49·2	55·7	46·7 for 26 years 1879–1904.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
	58·5	57·8	54·1	46·6	42·2	37·6	
On grass..................	27·9	27·3	29·4	32·1	37·2	43·5	35·9 „ 19 „ 1886–1904.
	46·7	46·1	42·1	36·1	32·8	28·5	
At a depth of 1 foot ...	37·0	37·1	38·5	42·8	48·5	54·6	46·4 „ 20 „ 1885–1904.
	57·7	56·9	53·8	47·5	43·0	38·9	
At a depth of 2 feet ...	38·0	38·0	39·0	42·8	48·0	53·6	46·7 „ 20 „ 1885–1904.
	56·9	56·6	54·1	48·6	44·2	40·2	

WARMEST MONTH.		COLDEST MONTH.	
At 4 ft. above ...	July 1901, 63°·2	At 4 ft. above ...	Feb. 1895, 27°·8
On grass	July 1899, 49°·8	On grass	Feb. 1895, 14°·9
At 1 ft. below ...	July 1901, 60°·0	At 1 ft. below ...	Feb. 1895, 32°·2
At 2 ft. below ...	Aug. 1899, 59°·3	At 2 ft. below ...	Feb. 1895, 33°·6

The absolute highest temperature recorded at 4 feet above grass was 86°·9 on July 18th, 1901.

The absolute lowest temperature recorded at 4 feet above grass was +0°·5 on Feb. 8th, 1895.

The absolute lowest on the grass (*i. e.* on snow), Feb. 8th, 1895, −8°·9.

The only time the one-foot thermometer has been below freezing-point was from Feb. 11th to Feb. 23rd (inclusive), 1895. Lowest 31°·2, on Feb. 15th, 1895.

Lowest temperature of two-foot thermometer from Feb. 19th to 26th, 1905, 32°·9.

Mean Temperatures (° F.) taken at Huddersfield Cemetery in the Coal-Measure Area for the 28 *Years* 1877–1904.

Altitude 400 feet.

							Year's mean.
	Jan.	Feb.	Mar.	April.	May.	June.	
At 4 feet above grass......	36·7	37·7	40·1	44·2	49·7	56·3	46·9
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
	59·4	58·4	54·5	46·8	41·7	37·7	

For the last eight years, 1897–1904, owing to the relatively high temperature of the winter months, the yearly average was 47°·8 F.

WINTER AVERAGE.	SUMMER AVERAGE.
Dec.–Feb............. 37°·3	June–August ...... 58°·0

No records of temperature are available for the Moss Moor, but estimating the decrease at the rate estimated by Dalton, viz., 1° Fahr. for each successive ascent of 100 yards, we may give the temperature of the Moss Moor at 44° F., and for the highest points probably 42° F., while that of the lowest levels would be 47°·5 F.

I am indebted to Mr. J. Firth for details of rainfall and temperature taken at the Huddersfield Cemetery, to Mr. Joshua Robson for the records at Dalton, and for the remainder to Mr. J. W. Schofield, Waterworks Manager to the Huddersfield Corporation; while Mr. Charles Brook has kindly supplied me with the interesting records of temperature taken at Harewood Lodge, Meltham.

(a) *Cotton-Grass Zone of the Moss Moor.*

The term Moss Moor has been adopted by W. G. Smith (88) as the equivalent of the German "Hochmoor" or "Moosmoor," a term especially suitable as these moors are often known locally as "Mosses"—*e. g.*, Harden Moss, Holme Moss, and Featherbed Moss, the latter being a very suggestive name when the cotton-grasses are in fruit.

This region is to the extreme west of the district and is a portion of the Pennines. The hills run from N. to S. with an altitude of from 1700 to 1100 feet. The rainfall is high (45 inches or more), and this is therefore an important catchwater area for the manufacturing towns and villages in the valley below. The geological formations here are the Kinderscout grits, and above them extensive deposits of shales and clays. Developed on these are large beds of deep ill-drained peat covered almost entirely with cotton-grasses, chiefly *Eriophorum vaginatum*, L., and to a much less extent *E. angustifolium*. These stretch for miles in monotonous characteristically rippled sheets with very few associates. The saddle-backed ridge extending from West Nab to Shooter's Nab is an outlier of rough rock, the eastern slopes of which are covered with fallen blocks due to the denudation of the shales beneath. In the drier parts and hill-summits the cotton-grasses are replaced by Bilberry (*Vaccinium Myrtillus*), *Empetrum nigrum*, Linn., *Vaccinium Vitis-idæa*, Linn., and Cloudberry (*Rubus Chamæmorus*, Linn.). The cotton-grasses play a very insignificant part in the flora of our present woodlands.

There is considerable evidence which points to the cotton-grass being of recent development, at any rate over certain parts of this moorland. Borings and excavations made at Deerhill, Good Bent, and Wessenden Head reveal a layer of buried heath-stems beneath the present cotton-grass, and persons now living (gamekeepers, &c.) can remember large tracts being covered with ling (*Calluna*) which are now dominated by cotton-grass (*Eriophorum vaginatum*, Linn.). At Wessenden Head considerable changes have taken place in this direction even within the last eighty years. This is attributed to interruption with drainage. During the last few years attempts have been made to improve the drainage by cutting long "grips" in the peat. This has already had a very marked effect, the cotton-grass shows evident signs of deterioration, while young shoots of ling are appearing in myriads over the area and its re-establishment is only a question of time.

Although now a treeless zone, forests were formerly extensive, and much buried timber is found here. An extensive deposit exists at Deerhill, chiefly of Birch (*Betula*) and a little Oak and Hawthorn (*Cratægus*). Buried trees (chiefly Birch) are also to be seen at Butterley Hill and Wessenden Head, and during excavations for a reservoir near Meltham a number of buried trees were found consisting of Oak, Birch, and Hazel (49). The position of these deposits is indicated on the District Tree Map.

I have not found the Scotch fir (*Pinus sylvestris*) in the peat of these moors, but Hughes (50) says:—"The immense quantities of fir and oak wood, more particularly the former, dug out of the moors surrounding Meltham give abundant proof that .... extensive forests of these trees must have covered the hills .... This fir wood, afterwards dug up out of the moors in hundreds of cart loads, was used as torches by the cottagers within the last 70 years. They cut it into long splinters and made it serve for candles." In Switzerland and elsewhere on the the continent, such pine splinters (or "Kienspähne") are still frequently used for this purpose. The altitude of these moors ranges from 800 to 1100 feet. This succession of deposits is well seen in section at Wessenden Head and Deerhill, where the series has been cut through by moorland streams. At the base is a thick bed of bluish clay which is permeated by numerous root-fibres. Above this is the moor pan, a layer of only a few inches in thickness, which can be easily detected by the peculiar grating sound produced when the blade of a knife is pushed into it. Resting on this is a thick bed of peat from four to six feet in thickness, while in some parts it very greatly exceeds this. At the base of the peat, remains of birch are abundant, especially at Deerhill, where the overlying peat, having been denuded, a very large number of birch remains are to be seen. We have here just those conditions necessary for the accumulation of peat, as indicated by Hall (43), Livingstone (60), and others, viz., considerable rainfall and an impermeable stratum, which result in a waterlogged soil, cutting off access of air and so checking the process of oxidation and the development of aerobic bacteria. These conditions, together with the poverty of the soil in mineral salts, especially carbonate of lime, favour the accumulation of humus and of humic acid; this in turn affects the osmotic action of the roots, with the result that, even in permanently wet places, xerophytes only can exist, and these are also favoured by the general climatic conditions of this zone. A general account of these peat-moors has recently been given by C. E. Moss (71).

On the steep hill-slopes peat is either very thin or absent, the soils being formed by denudation of the grits, shales, and clays, and forms a transition region to the Heather Zone of the Millstone-Grit Plateau.

These slopes are clothed with a very characteristic vegetation. *Pteris* is the dominant plant, and its associates are Bilberry (*Vaccinium Myrtillus*), Ling (*Calluna*), *Deschampsia*, *Nardus stricta*, and *Festuca ovina*, forming a Xero-pteridetum. These may be traced ascending the deep cloughs in gradually narrowing strands, the Bracken becoming reduced in size (sometimes not more than a few inches in height) until on the exposed summits it is practically absent. A map showing the distribution of

Bracken, therefore, gives us a very good outline of these slopes of the moorland valleys and cloughs, and up these it ascends to a height of 1700 feet. (Fig. 10, p. 353.)

To the east it descends along the valley-slopes in broken strands to spread out in sheets on the plains when protected by trees, to be again cut out by the deep shade of Sycamore, Elm, and Beech.

The woodlands of the hill-slopes consist chiefly of Oak, Birch, and Pine. All are planted, but are often on the sites of primitive forest or scrub, and none of the woods in this or the two other zones considered is now primitive. They are given up rather to the preservation of game than to the growth of timber. Not much felling or pruning is done, and thus they remain practically undisturbed for long periods. The Oak ascends to 1200 feet, but dies out above that limit, and the undergrowth is essentially that of the adjacent moorlands. In the neighbourhood of Harden Moss are Pine-plantations from 1500–1100 feet, and again at Black Moor from 1000–800 feet; but here they are fully exposed to the prevailing winds, thrive badly, and in several areas all the trees are dead. The undergrowth is chiefly Bilberry (*Vaccinium Myrtillus*).

(b) *Heather Zone of the Millstone-Grit Plateau.*

The central portion of the district is sharply marked off from the western, and consists of a magnificent Millstone-Grit plateau, through which deep narrow valleys have been cut into the shales below by the tributaries of the river Holme. Though now highly cultivated, it was formerly a heather moorland, and the several portions are known as Thickhollins Moor, Melthan Moor, Black Moor, Honley Moor, Netherton Moor, and Crosland Moor. This plateau dips gently to the S.E. from 1000 to 450 feet. The soils are shallow, sandy, well drained, and in places covered with a thin deposit of peat usually not more than 6–12 in. deep. In contrast to the Moss Moor, the conditions here are such as to be unfavourable to the formation of deep ill-drained peat. Some of this, as at Honley Woods, is Bracken peat, being composed almost entirely of the remains of this plant, and though this species is still present and in places abundant, the Ling and Heath associates are now dominant. This area is swept by the prevailing west winds, and in the spring by the dry east winds, which, together with the soil-conditions, favour the development of Xerophytes. It is a typical physiologically dry area. Although the unreclaimed heather moors are now small in extent and somewhat widely separated, the roadside vegetation often consists of the relics of the original moorland, and is of the heather moorland type, and this indicated on the large-scale maps shows the present moorlands to be joined by a network of heath-plants. This primitive vegetation is only kept in check by heavy manuring, and if that is neglected the fields soon revert. Many acres which formerly produced rich crops have now "gone back" to moor. This type of vegetation extended formerly over the whole of the Gritstone area. The features thus brought out help us in great part to reconstruct the former vegetation of the Moss Moor and Millstone-Grit plateau.

Although the rainfall in the latter area is considerable, the soils are so permeable and poor in humus that they retain little water. Heavy manuring in a great measure corrects this, but when this is discontinued the less resistant cultivated plants give way to xerophytes, which alone can withstand the drier conditions and the sudden changes of temperature to which such soils are liable.

As Graebner has shown, the effect of rich nutrition on heath-plants, while it favours increased growth, renders them less able to withstand the extremes of drought and cold.

Oak is the dominant tree, but prior to cultivation, as shown by Moorhouse (69) and in ancient records, it was much more extensive in this area. Along the edges of the plateau, Birch (*Betula verrucosa*, Ehrh.) is abundant and at Honley Moor are plantations of Pine, while Holly (*Ilex Aquifolium*, Linn.) is common on the slopes of Honley Wood. The tendency in recent years has been to replace Oak with Sycamore, Elm, and Beech. Woodlands are developed chiefly along the valley-slopes, and on the map they give a general idea of the contour of the country, and appear much narrower than they really are. The eastern boundary of the Gritstone plateau is well marked by these woods, the woods on the plains being characterized by their broader (squarer) outlines.

The prevailing west winds sweep across these plains, and a reference to the map will show that plants growing in the open oak-birch woods, along the edge of the plateau, are placed under conditions of drought and exposure (especially when we remember the shallow sandy nature of the soil here) in strong contrast to species in the same wood growing on the steep, moist, sheltered slopes. The trees, too, on the exposed parts are generally stunted, being little more than tall shrubs.

(c) *Coal-Measure Area.*

The river Holme forms a well-marked boundary between the Millstone-Grit plateau and the Lower Coal-Measures. The rocks here consist of shales, clays, and fine-grained sandstones often in rapid alternation. The soils offer a striking contrast to those of the west; they are generally deeper and consist of more or less clayey loam, and therefore moisture is more constant. The general altitude of this area ranges from 450 to 200 feet, though to the south-east the hills rise to 1200 feet. In parts (usually the higher level) the soils, where they lie immediately above the sandstones, are not uncommonly shallow, well-drained, relatively dry, and yield a flora distinctly xerophytic. It is on these soils that the heath-plants—Bilberry, Ling, *Deschampsia*, and others—are carried, often in small patches, to the east. In the days prior to high cultivation there is evidence that these tracts were much more extensive than at present, and yielded species now extinct, such as *Listera cordata*, R. Br., &c. While Oak is still the dominant tree, there is a greater development of Sycamore, Elm, and Beech. With the deeper soils, increased moisture, lower altitude, and less exposure the trees thrive better and attain much greater dimensions than in the higher regions to the west. But in both areas, though more especially to the east, tree-growth is handicapped by the smoke-cloud from the manufacturing towns and villages in the district. The undergrowth consists largely of mesophytes, the three characteristic plants being Bracken (*Pteris aquilina*), *Holcus mollis*, and *Scilla festalis*, forming a Meso-pteridetum. To the south-east, in the neighbourhood of Cheese Gate Nab and Pike Lowe, however, the hills ascend to 1200 feet. They are capped with Grenoside Sandstone, and here, as well as on their steep and exposed shaly slopes, we get a repetition of the xerophytes noticed on the slopes to the west, viz., *Vaccinium Myrtillus*, *Calluna Erica*, DC., *Erica cinerea*, Linn., *E. Tetralix*, Linn., *Pteris*, and xerophytic grasses; these plants also form the characteristic vegetation of the undergrowth of the woods on these hill-slopes.

Distribution of the Plants of the Millstone-Grit and Coal-Measure Areas, as affected by Soils.

It is evident from the above observations that a change of geological formations and soil-conditions is accompanied by a change of plant formations.

In illustration of this we will take the upper central portion of the district shown on the maps figs. 9 & 10 (pp. 352–3), that is, the part covered by sheet 260 of the 6-inch Ordnance-Survey map. Here the two well-marked biological types occur, xerophytes and mesophytes, and their distribution has been worked out on the 6-inch map, special attention being paid to the transition region from the Millstone-Grits to the Coal-Measures. On the map fig. 11 (p. 364) the results are shown reduced to the 1-inch scale.

Fig. 12 shows the geology of the same area, the details being taken from sheet 260 of the 6-inch Geological-Survey map, and, as in fig. 11, reduced to the 1-inch scale. Glacial deposits are entirely absent, and, except for the formations of peat already referred to, the soils owe their origin mainly to the denudation of the underlying rocks, and therefore a comparison may, I think, be fairly made with the solid geology map.

If we now make a comparison of the two maps figs. 11 & 12, we find them both instructive and suggestive. *Pteris,* as we have seen, is abundant in both areas, but its associates differ considerably as we pass from one formation to the other. The xerophytes are seen to follow pretty closely the Millstone-Grit and Coal-Measure sandstones, except in the exposed, elevated regions; while the mesophytes indicate as clearly the shales and clays.

To render comparison easy, the same signs are used on the two maps: the blackened areas indicate shales and clays on the geological map and Mesophytes on the vegetation map; the other sign indicates respectively sandstones and Xerophytes, a small semi-xerophytic area is indicated by dotting.

Considerable differences occur in the physiological water in soils over beds indicated by the general term shales, and a more detailed study of these is in progress on lines similar to those followed by Hedgecock (45).

In some instances, Xerophytes are absent over areas indicated as sandstone on the Geological Map, as in Woodsome and

Roydhouse Woods, but in these cases the sandstones are covered by a considerable depth of moist loam; while, on the other hand,

Fig. 11.

MAP SHEWING DISTRIBUTION OF XEROPHYTES & MESOPHYTES. 11.

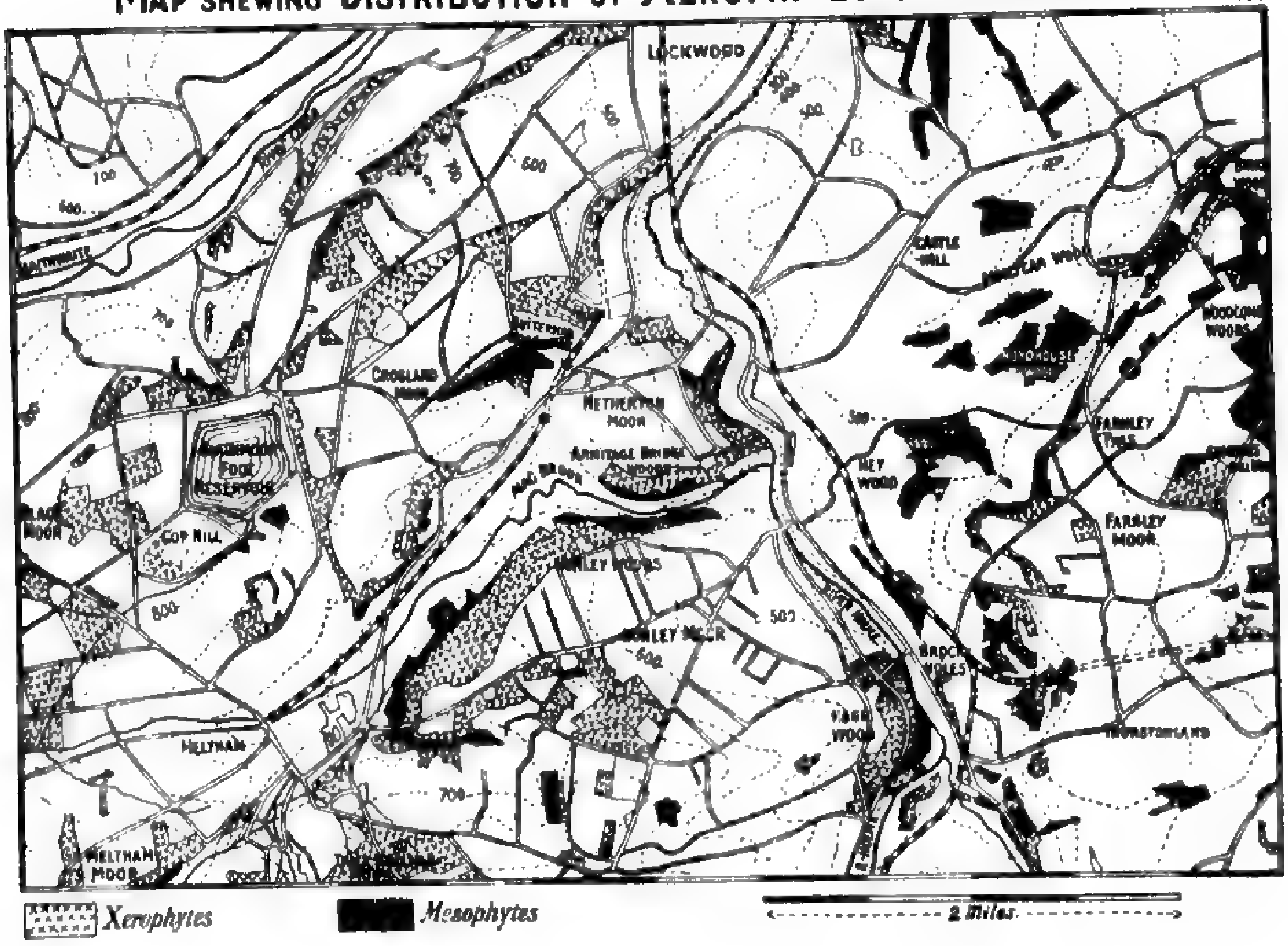
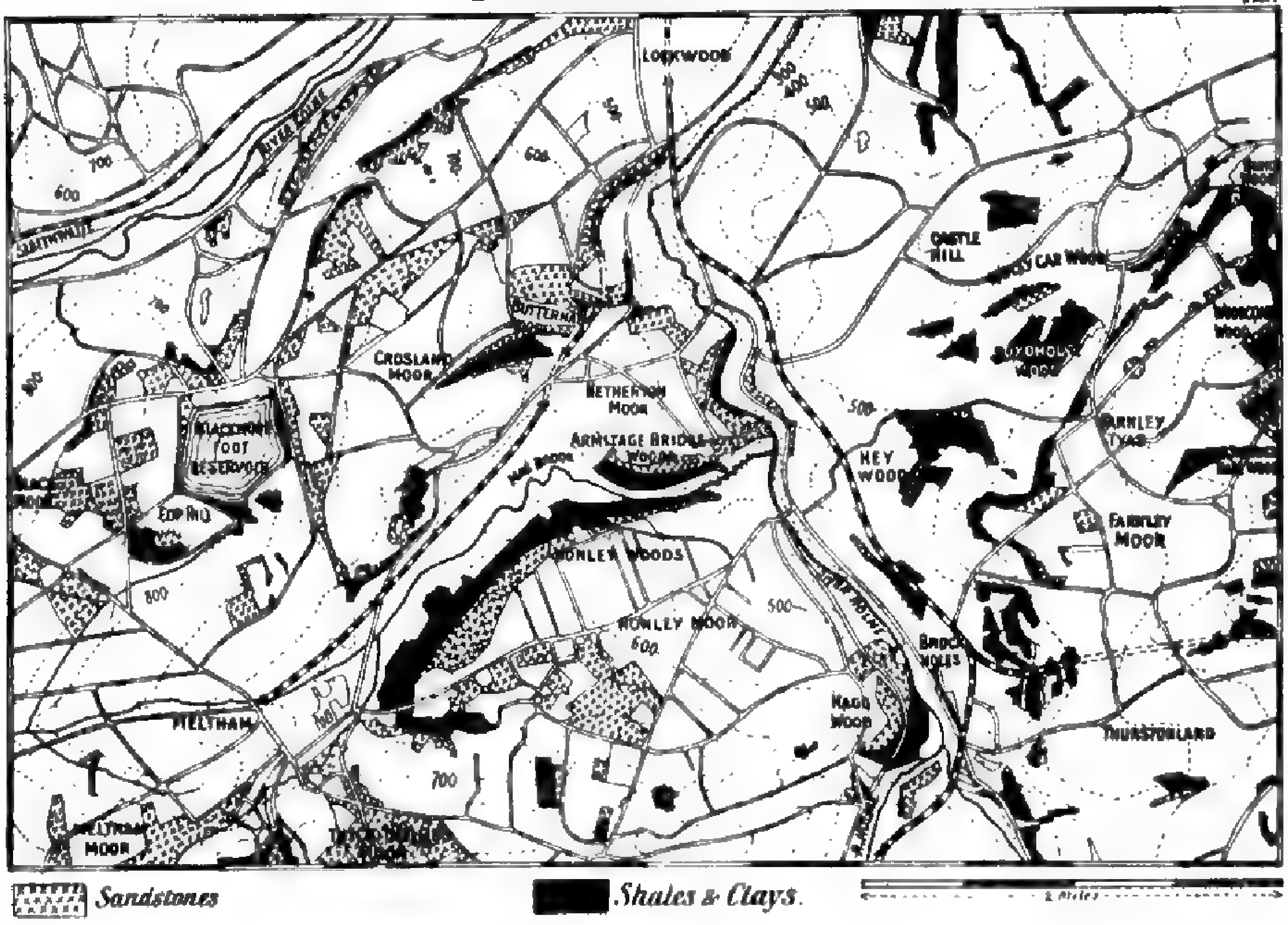

Lockwood
Slaithwaite
Castle Hill
Woodcock Woods
Royd House Wood
Crosland Moor
Netherton Moor
Armitage Bridge Woods
Blackmoorfoot Reservoir
Cop Hill
Hey Wood
Farnley Tyas
Farnley Moor
Honley Woods
Honley Moor
Brock Holes
Hagg Wood
Thurstonland
Meltham
Meltham Moor
600
700
800
500
Xerophytes
Mesophytes
2 Miles

Fig. 12.

GEOLOGICAL MAP. 12.


Lockwood
Slaithwaite
Castle Hill
Woodcock Woods
Royd House Wood
Crosland Moor
Butternab
Netherton Moor
Armitage Bridge Woods
Blackmoorfoot Reservoir
Cop Hill
Hey Wood
Farnley Tyas
Farnley Moor
Honley Woods
Honley Moor
Brock Holes
Hagg Wood
Thurstonland
Meltham
Meltham Moor
600
700
800
500
Sandstones
Shales & Clays
2 Miles

Xerophytes occur on areas indicated as shales, but the soils here are dry and poor. Though the line is often distinctly marked between the two, there is not infrequently an overlap—the Xerophytes being carried further down the slopes, due partly to the surface being strewn with fallen blocks of sandstone and soils resulting from their denudation. As we have seen, the more resistant sandstones usually occupy the higher ground, and the conditions of soil and climate there favour Xerophytes; while shales occupy the lower levels and sheltered slopes, where soils and climatic conditions favour the development of Mesophytes.

As we follow the species over the escarpments, we find that, on reaching the shales and clays, Ling is the first to die out, which it does very quickly. The Bilberry often extends further down the slope, but, as with Ling, it dies out as the humus becomes deficient, while *Deschampsia* holds on when both its usual associates have disappeared. These features can be well shown in a limited area, as in the case of the Armitage Bridge Woods (fig. 8, p. 349) or other woods skirting the Millstone-Grit Plateau, where, on the steep slopes, we get a rapid transition from the dry exposed grit area above to the moist sheltered slopes of the shales and clays below. These results fully bear out Warming's observations that the distribution of plants is determined largely by available water.

A comparison of the four maps (Trees, Undergrowth, Geology, and Xerophytes and Mesophytes) will show the effect of the dominant factors on plant-distribution in this area, viz.: soils, moisture, exposure, light, and shade.

In the field I found it very convenient to use special terms for these soil types, and had intended suggesting names which seemed to express well the associations in relation to soil-conditions; but, considering the unsettled state of Ecological Nomenclature, and that it will soon be considered by an international committee, I have withheld them. As one may gather from a perusal of Clement's paper (16), the study of ecology may very easily be burdened with many cumbrous names which to me it seems well to avoid if possible. The terms I have used, Xero-pteridetum and Meso-pteridetum, are easily understood, and indicate sufficiently well the two important associations determined by soil-conditions in this district.

Livingstone (60) has evidently been working on similar lines in a glaciated area in Michigan, but paying special attention to the distribution of trees, and has obtained corresponding results.

II.—Effect of Environment on Structure.

From what has been said, it is clear that these common species must frequently grow under very dissimilar conditions, and in examining the plants in the transition zone, or zone of tension as Cowles terms it, it is at once obvious that a change of conditions, while not immediately limiting their distribution, produces a marked effect on their habit and structure. We find that as the Mesophytes invade the region of the Xerophytes, and come under the influence of drier and more rigorous conditions, they develop xerophytic characters. On the other hand, as the Xerophytes encroach on the Mesophytes, and come under the mellowing influences of moisture and shade, they tend to lose xerophytic characters and take on mesophytic characters. The more plastic or adaptable a species is, the wider its range of variation and distribution; the less plastic or adaptable species show a narrow range of structural variation and a more restricted distribution. Between these extremes we find every degree of modification. My object has been, therefore, to ascertain the region of maximum development of a few common species, study their conditions of growth, and determine to what extent a change in one or more of these conditions has upon their structure.

Judging from a summary of the investigations made by Chrysler (13), similar changes have been noted in the strand-plants occurring on the Atlantic Coast in the vicinity of Woods Hole, Mass., and also near Lake Michigan near Chicago, Ill.; and Hesselman (47) has recently published the results of his investigations of the plants of the "Laubwiesen" of Sweden, and they agree closely with mine.

The study of Plant Biology has of late received considerable attention, and the works of Schimper, Goebel, Wiesner, Stahl, Haberlandt, &c. provide us with a useful foundation on which to build further investigations into the complex relations and life-histories of the plants forming these associations.

There is perhaps a danger, when studying the structure of a plant in relation to its environment, to assume on insufficient grounds direct adaptation. A useful and timely corrective in this direction is the recent excellent criticism by Detto (23). The point of view adopted by Küster (54) is also worthy of careful consideration in this connection. Many of the modifications usually attributed, for example, to the direct influence of light, mechanical forces (as strain), &c., he would consider rather as pathological states due to insufficient nourishment, lowered transpiration, and the like.

Again, the results obtained by the examination of the tissues of plants exposed to sun or shade are sometimes contradictory. It is generally admitted that what are known as "sun-leaves" are developed in situations exposed to intense sunlight, as on sand-dunes, moorlands, Alpine regions, as well as under less rigorous conditions.

Leist (56), however, in examining the leaves of Alpine plants, came to the conclusion that they showed mesophytic rather than xerophytic, shade rather than sun, structures, and gave as an explanation the considerable period during which the mountains are enveloped by clouds.

Wagner (97), on the other hand, came to the opposite conclusion, and found that the "sun" type and xerophytic structures became more pronounced with increased altitude and the accompanying xerophytic conditions. This accords with the observations of Bonnier (7) and others, and also that transpiration and assimilation are augmented at high altitudes.

Wiesner's observations on transpiration (104) show that under the same conditions shade-leaves transpire more than sun-leaves. Bergen (5), however, in his study of the evergreens of the Mediterranean region, concluded that sun-leaves transpired more than shade-leaves under the same conditions.

The investigations of Ball (3) as to the value of stresses in the development of mechanical tissues has considerably modified our views on this subject; from his results we are no longer able to give such an important place to the effects of the stimulus of stresses as we were led to do by the earlier experiments of Hegler (46).

These instances will be sufficient to show that so-called adaptive structures will require in the future re-investigation, and that we are scarcely justified, in spite of the considerable work that has already been accomplished, in attributing dogmatically these modifications to particular factors. We may record the modifications and observe the conditions under which they are produced as far as we can discern them, but prolonged study, not only in the laboratory, but also in the field, will be necessary before satisfactory conclusions can be drawn.

We will now consider some of the modifications noted in the more important species characterizing the several associations of the Huddersfield district.

(*a*) DOMINANT SPECIES.

PTERIS AQUILINA, Linn. (*Pteridium aquilinum* Kuhn).

Bracken.

It has been already shown that the distribution of Bracken is extensive in this district. It is the dominant plant of the undergrowth in the Coal-Measure Oak woods, where it forms large and characteristic masses, but when the dominant trees are Sycamore, Elm, and Beech, or a dense shrubby undergrowth of Hazel or Elder, their deep shade tends to restrict its distribution. Outside these woods, it is confined mainly to the hedgerows, perhaps a relic of a former more extended distribution. It ascends into the Gritstone area, where, in the dry shallow soils, it is limited by competition with rhizomatous plants such as Ling and Bilberry. In the open Birch-Oak woods along the edges of the Gritstone Plateau many observations were made to determine the positions these rhizomes occupy with relation to each other. It was found that, in 95 per cent. of the plants examined, the rhizomes of Bracken were from four to six inches nearer the surface than was found to be the case in a corresponding number of observations in the Coal-Measure Oak woods. In areas where Bracken is associated with Ling and Bilberry, its rhizomes were found to be distinctly below those of the latter; while the rhizomes of Ling, though generally two to three inches above those of the Bracken, were not uncommonly found at the same level, and often they were distinctly interlaced. Here Bracken rarely forms continuous sheets, but is broken up into more or less isolated patches, as shown in the Heather area in the map of Armitage Bridge Woods (fig. 8, p. 349); and this is a characteristic feature in all dry Oak and Birch woods wherever these plants are associated; they form, as we have seen, a competitive association, and sometimes one, sometimes the other species dominates. In such situations, therefore, Bracken is much more exposed to adverse conditions, such as higher level, dry shallow soils, strong winds, much less protection by trees; and the rhizomes being more superficial, they are more likely to suffer injury through cold. As might naturally be expected, it is in the open, more exposed parts of this area that xerophytic characters reach their greatest development. In the treeless hill-region to the west it is a characteristic plant of the steep hill-slopes, where it is a striking feature in the landscape. These slopes offer it considerable protection, but the species dies out above as the exposure increases. The leaves here do not exhibit as a whole such strongly marked xerophytic characters as those of the Gritstone Plateau, for, although the plants are exposed throughout a considerable period to intense sunlight, the soil-conditions as regards moisture are on the whole more favourable.

Growing in such diverse habitats and under such varying conditions, the plant shows extreme modifications in structure. Very numerous specimens have been collected and examined, and my observations on the structure of the leaf bear out fully those of Boodle (9), and his suggestion that "light is not the all-important factor determining the structure of the sun and shade leaves," is supported by my observations of plants in natural habitats in this area. I should, however, say that light is only one of the factors, the other chief ones being wind and available moisture; for we find extreme shade-structures in sheltered moist situations under the shade of Beech and Elm, and the maximum sun-form in bright, illuminated, windy, dry situations on the Gritstone Plateau.

The admirable pioneer work of Stahl (92), also of Haberlandt (42) and Schimper (83), laid the foundations for observations of this kind, and they have been since extended in many directions by numerous observers. For a more extensive bibliography on leaf-structures and functions, reference may be made to Karsten (50 A) and Burgerstein (10).

Figs. 13–16 (p. 370) show transverse sections of corresponding pinnæ from plants growing under different conditions.

Fig. 13 is a section of a leaf from an open Birch wood on the Gritstone Plateau. Here the fronds are from 12 to 18 inches in height, are dark green in colour, and leathery, the plants barely overtopping the plants of Ling among which they grow. The epidermis has a thick cuticle, the cells of which are devoid of chlorophyll; beneath this is a nearly continuous hypoderm consisting of thick-walled colourless cells forming an aqueous layer. Between these are occasionally thin-walled cells which contain few or no chlorophyll granules. Below this is a well-developed palisade about three cells deep, followed by a reduced spongy tissue with relatively small air-spaces.

Fig. 14 is a section of a pinnule from the leaf of a plant grown in an Oak wood. The cuticle of the epidermis here is thinner, the cells contain few chlorophyll grains, and the hypodermis is developed only over the veins. The palisade, though well defined, consists only of two layers, and between these cells small air-spaces are frequent. In the spongy tissue the air-spaces are large.

Figs. 13–16.

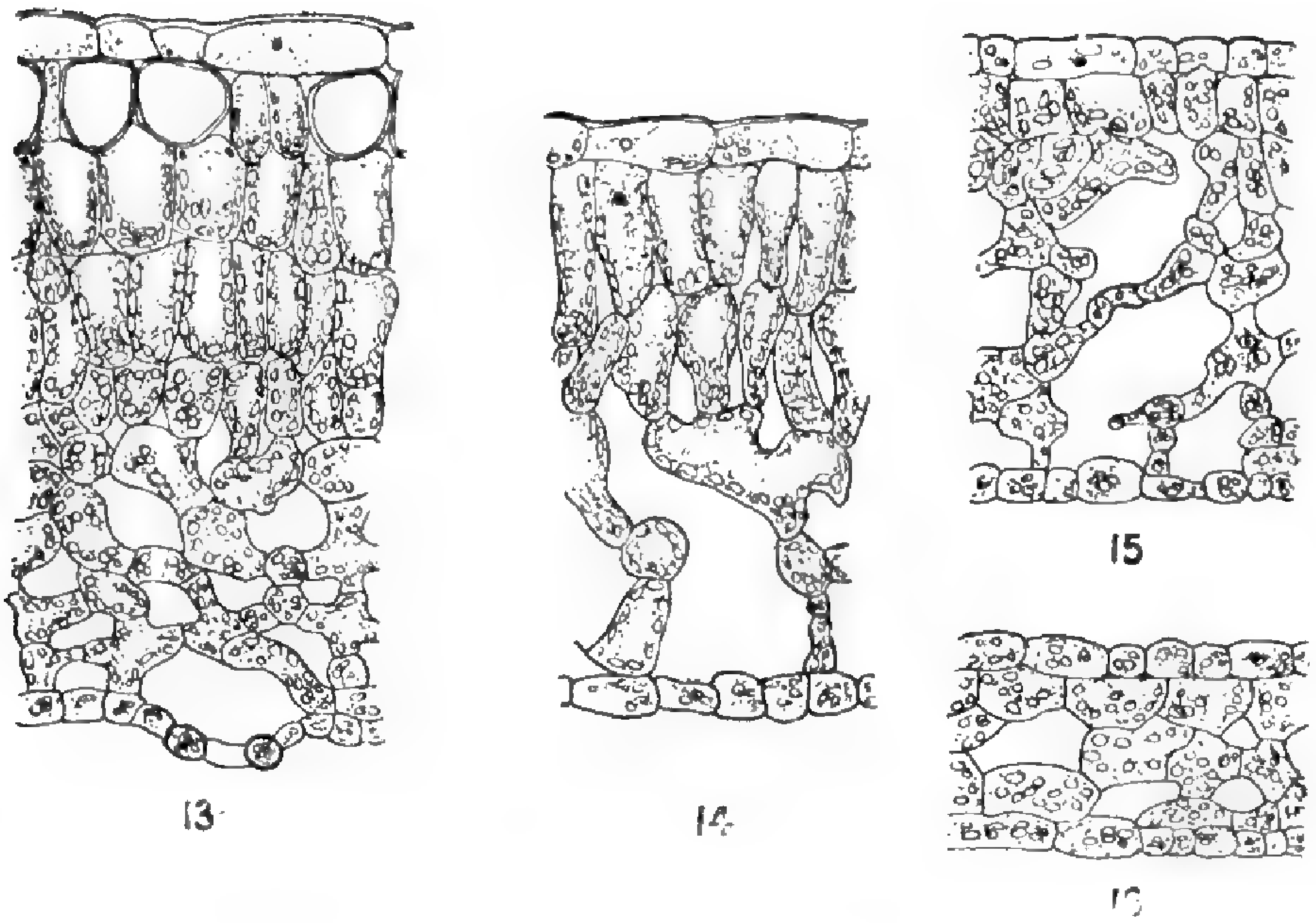


Fig. 13. Trans. sect. of a pinnule of *Pteris aquilina* from a plant growing under xerophytic conditions on the Gritstone Plateau.

14. Trans. sect. of a pinnule from a plant growing in the medium shade of an Oak wood.

15. Trans. sect. of a pinnule from a plant growing under the shade of Sycamore.

16. Trans. sect. of a pinnule from a plant growing under the deep shade of Beech.

Fig. 15 is from a frond growing in the shade of a Sycamore wood. In this case the cuticle is very thin, palisade greatly reduced, a spongy parenchyma occupying a very considerable part of the mesophyll. Chlorophyll corpuscles more frequent in the epidermis than in fig. 14. The leaf is therefore much thinner.

Fig. 16 shows the section of a leaf from a plant growing in a moist situation under the shade of Beeches. It is exceedingly thin, the epidermal cells are very thin-walled and contain numerous chlorophyll granules, while the mesophyll is reduced to two or three cells in thickness.

All these variations in structure may be found within a very limited area; *e. g.*, the woods at Armitage Bridge, as they afford all the necessary conditions. These woods skirt the edge of the Gritstone Plateau and extend over the steep slopes. Their higher parts are dry and sandy, and the soil is covered with a shallow peat, and the plants are exposed to the adverse conditions of the plateau generally. Bracken occurs in patches among the ericaceous undergrowth, and in the less protected parts develops extreme xerophytic characters. Over the moister, more sheltered slopes, protected by the Oak, it becomes more mesophytic in structure; while in the deep shade area in the slope, under Beech and Elm, it becomes extremely attenuated and eventually dies out.

The amount of shade produced by a given species of tree is not always the same; consequently we do not necessarily find shade-structures developed in herbaceous plants under shade species. Closeness of planting, age of tree, and the condition of its growth have to be considered.

Pteris aquilina. Leaf-stalk.

The examination of leaves from these different habitats showed that not only was the leaf-blade modified in structure according to environment, but also the leaf-stalk. For purposes of comparison, transverse sections were made in each case 1½ in. below the lowest pair of leaflets. These are shown in outline in figs. 17, 19, 21, 23, 25, 27 (p. 372). Portions of these are shown × 150 diam., taken through the tissues of the same region in each case. Fig. 17 is a section from a plant growing in a dry windy situation in an open Birch wood on the Gritstone Plateau. Here we see (fig. 18) the stereom is very strongly developed, and the cavities of the fibres are reduced to minute pores. This band is 13 or 14 cells deep, encroaching closely on the outer steles, and the thickening is continued into the ground-tissue still further. If portions of these leaf-stalks are cut off and tapped together, they ring like dry bones. The stereom as here developed

Figs. 17, 19, 21, 23, 25, & 27.

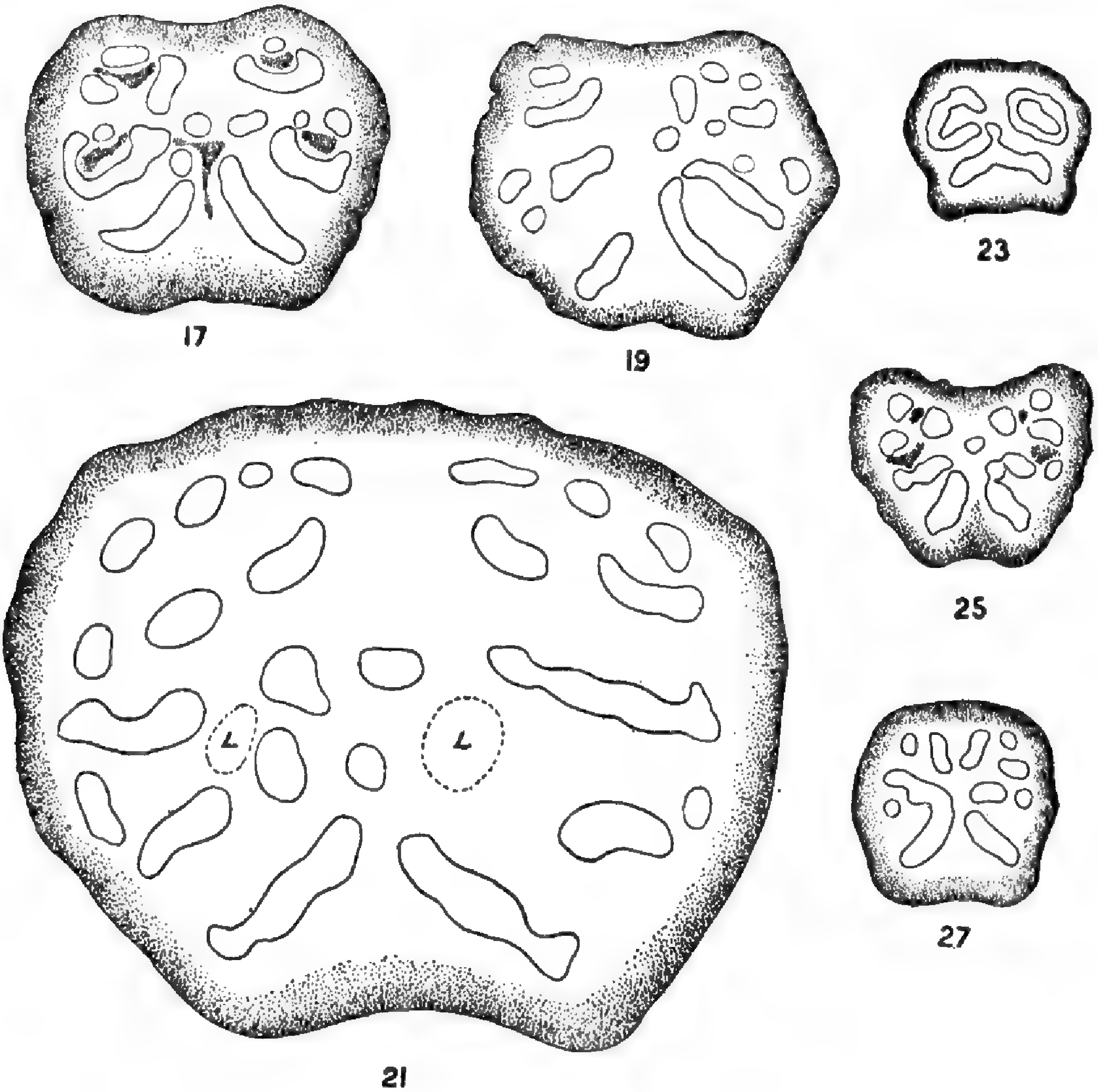
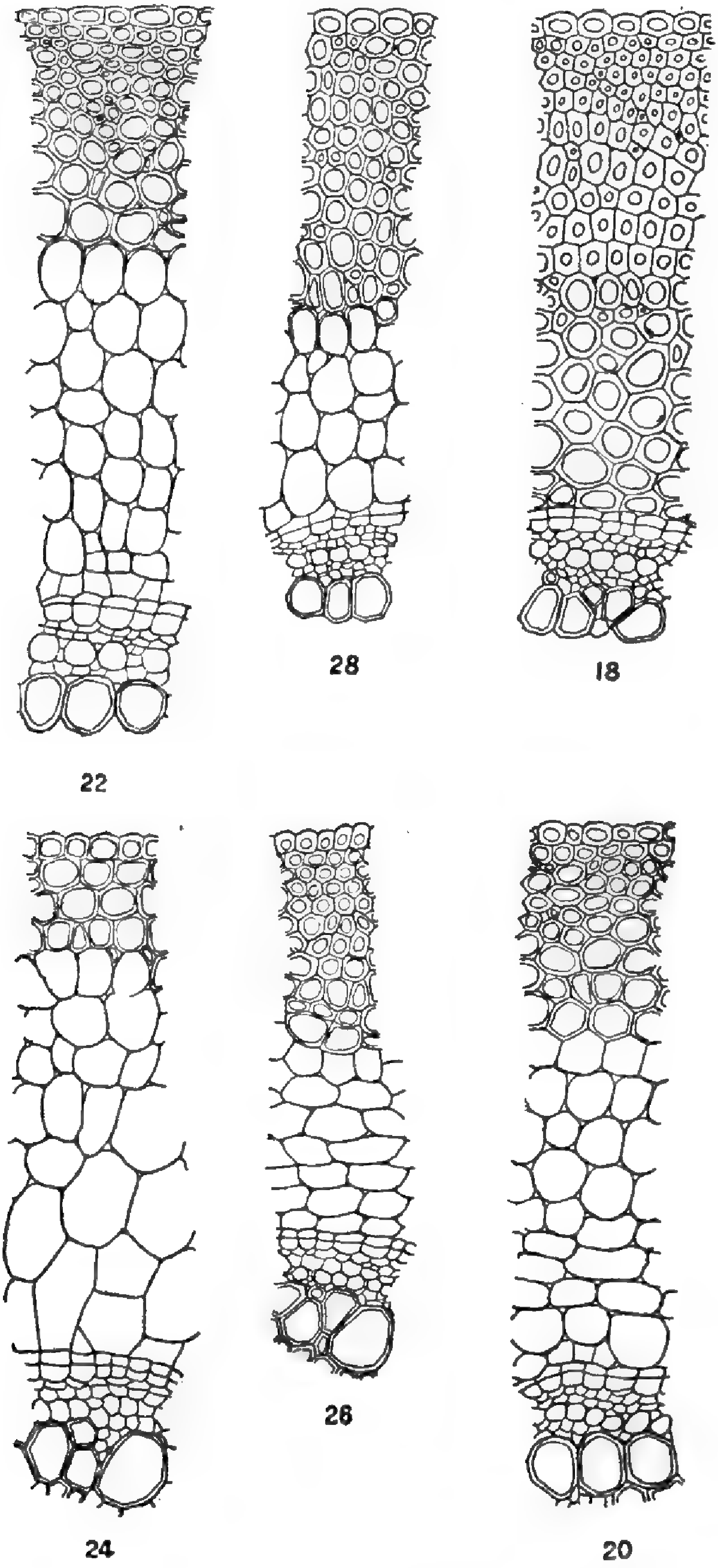


Fig. 17. T. S. leaf-stalk from exposed situation of Gritstone Plateau.
18. T. S. portion of the same; × 150 diam.
19. T. S. leaf-stalk, Oak-wood form.
20. T. S. portion of the same; × 150 diam.
21. T. S. leaf-stalk from a very large frond from a moist Oak wood. *L* = lacunæ.
22. T. S. portion of 21; × 150 diam.
23. T. S. leaf-stalk of an immature shade-form.
24. T. S. portion of 23; × 150 diam.
25. T. S. leaf-stalk, mature shade-form.
26. T. S. portion of 25; × 150 diam.
27. T. S. slender leaf-stalk, Oak-wood form.
28. T. S. portion of 27; × 150 diam.

Figs. 18, 20, 22, 24, 26, & 28.



Leaf-stalks of *Pteris aquilina*, showing variations in the development of stercom in plants growing under different conditions.

will be of service in resisting strain in every direction. The stem is further strengthened by the development of well-marked stereom-strands between the steles (fig. 17).

Bracken Leaf-stem. Oak-form.

The leaf-stalk of a plant growing under moderate conditions of light, moisture, and wind in a Coal-Measure Oak wood shows in transverse section a somewhat cylindrical outline (fig. 19), flattened or slightly depressed, along the upper and lower surfaces. The sclerenchyma forms a firm but narrow band, often not more than four to five cells deep, with a slight tendency to increase along the upper surface (fig. 20). The supporting mechanism is that of a pillar or strut, and the great majority of specimens examined showed very little specialization beyond this, even in cases of very large fronds with leaf-stalks $\frac{3}{8}$ in. or more in diameter. In these the tendency is to develop one or more fairly large lacunæ (figs. 21 & 22).

Leaf-stalk. Shade-form.

If we now examine plants growing in the deep shade of Elm or Beech, we find the leaf-stalk strikingly reduced, often less than $\frac{1}{8}$ in. in diameter. Relatively large, very thin fronds are developed, but the leaf-stalk is too weak to support the weight of the blade, and the general habit of the plant is drooping or more or less prostrate. Fig. 23 is a transverse section of the leaf-stalk of a young frond, which had grown about a foot above the surface of the ground and before the blade had expanded. The outline is somewhat circular, but with a distinct tendency to flatten on the upper side. The sclerenchyma is slightly developed peripherally, forming a very narrow band two or three cells deep (fig. 24). As the leaf-stalk matures and the frond unfolds, it will be under the stimulus of slight but continuous stress, and a comparison of this with the mature form shows striking changes to have taken place (figs. 25 & 26). The outline becomes less circular, and a well-marked girder-form is developed; the tension-flange is narrow but considerably thickened, with a distinct wedge of sclerenchyma in the centre. The compression-flange is broadened considerably and develops lateral wings, which not only serve to withstand compression, but stiffen it for resisting lateral stresses, just as girders are sometimes stiffened by side-pieces to resist lateral vibrations. In addition we find lateral stereom strands developed in the ground-tissue between the steles. These might be compared to the similar strands found in the exposed form. Fig. 26 shows these outer tissues with the much thickened stereom-band. Under these conditions and in such habitats, this form frequently recurs throughout the district.

Frequently we find leaf-stalks of a similar diameter in the Bracken of an Oak wood, but they are erect, not drooping. They are subjected mainly to compressive stresses, and the tendency of the stalk is to form the strongest strut or pillar. A transverse section (fig. 27) of such a slender-stalked form, therefore, shows a distinct pillar-mechanism with the strengthening material as far from the centre as possible. The outline is somewhat circular, with a uniform band of much-thickened sclerenchyma nine to ten cells deep (fig. 28), the fibres of which are more brittle than in the deep-shade form. In this the strands between the steles are often not developed.

The Bracken thus affords an interesting example of the development of mechanical tissues apparently as a result of tensile and compressive stresses. In the shade-form the stresses are small but continuous, due to the weight of the relatively large frond. Under opposite conditions in dry, open, windy situations, although the plants are dwarfed and thus relatively protected, the stalk is affected by varying stresses in all directions, and here we find the development of the stereom to be enormously increased. Under medium conditions, in the shelter of an Oak wood, the leaf-stalk is tall, erect, and pillar-like. Every gradation between these forms is found under intermediate conditions. Many of the specimens first examined showed these features to recur so often as to give support to Hegler's results (46). But forms were found which introduced an element of uncertainty; and it is obviously impossible to judge of all the conditions influencing these structures in the field. The exceptions were frequent enough to show that although the stimulus of stresses might be a contributory cause, evidently other influences were at work as yet undetermined. The evident pliability of this species recommends it as suitable for experiments in this direction, but the results are as yet too incomplete to be dealt with here. Ball (3), who has recently repeated Hegler's observations, contends, as the result of numerous interesting experiments, that the development of mechanical tissues is not so induced; and he failed to produce either increase in the ability to resist mechanical pulling, or any thickening of the tissues, as the result of a gradual increase in the pull exerted upon young stems. The results he produced were inconstant—sometimes a thickening was produced, sometimes not. We must look, therefore, to some other (probably a series of interacting) causes for a full explanation of the development of stereom.

Pteris aquilina. *Rhizome.*

Many observations have been made and much has been written on the presence or absence of *Pteris* on calcareous soils, and the influences of the physical and chemical nature of the soil on its distribution and structure. In West Yorkshire it shows a distinct preference for sandstone soils, but, as indicated by Lees (55) and others, it is by no means absent from limestone; while More (70) includes it in the group "Calcifuge B," that is, not infrequent on lime soils, but invariably in greater abundance and luxuriance on soils from which lime is absent. More recently its distribution from this point of view has been dealt with by Gillot & Durafour (34). In the Huddersfield district calcareous soils are absent, therefore lime cannot be one of the factors influencing its distribution within this area.

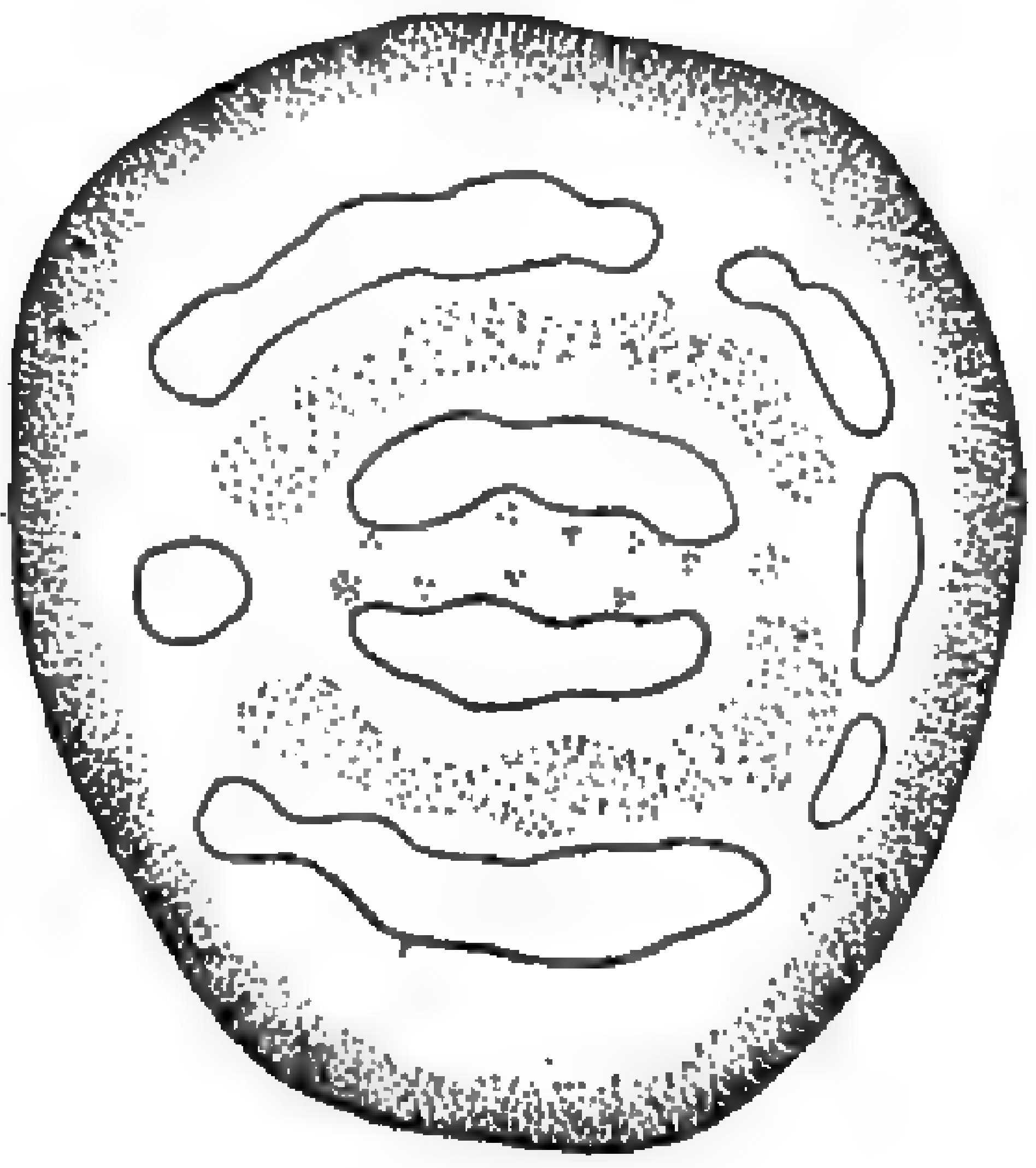
Masclef (64) examined the rhizomes of Bracken growing respectively in clayey and calcareous soils on the escarpments at Rogerville and Harfleur and also on the granite rocks at Cezembre. He found that in siliceous soils they present the normal structure; in soils impregnated with lime the sclerenchyma was greatly developed, the outer band of reserve conjunctive tissue being reduced to half its normal diameter; whilst in pure chalk the sclerenchyma was increased to such an extent as to reduce the reserve tissues to a very narrow band. These changes he attributes to the chemical influence rather than to the physical nature of the soil. He found that specimens collected on soils containing 5 to 7 per cent. of lime showed structures between those growing on pure chalk and those growing on exclusively siliceous soils. No such quantity of lime could be expected in the soils in the Huddersfield district, and careful analyses of many samples showed them to contain from ·02 to ·04 per cent. of lime; yet an examination of the rhizomes of plants growing in sandy soils containing ·03 per cent. of lime on the Gritstone Plateau showed modifications exactly similar to those attributed by Masclef to the chemical influence of lime. I can find nothing in a chemical analysis of these soils which helps to account for these striking variations, but would rather attribute them to physical and climatic conditions. Certainly here the modifications cannot be attributed to the chemical influence of lime. The study of vegetation in this region tends to support the conclusions and experiments in this direction of Warrington (103), Hedgecock (45), and others.

In the moist sheltered situations over clays and shales of the Coal-Measures and under the shade of Beech, the rhizomes lie in the loose humus near the surface and may be very easily uprooted. Here they are relatively slender, easily break, and are scantily covered with brown hairs.

Fig. 29 (p. 378) is a diagram of a transverse section of such a rhizome, and fig. 30 shows in detail the structure of the mechanical tissues. The epidermis consists of thin-walled and wrinkled cells, and beneath this is a single line of dark brown cells whose outer and radial walls are strongly thickened and pitted. This is succeeded by a band 3–4 cells deep with yellowish, very slightly thickened walls, these cells containing a small number of starch-grains. The two bands of sclerenchyma between the outer and inner rings of steles, consist of cells with pale brown, slightly thickened walls, and contain numerous starch-grains.

In striking contrast to this, the rhizomes of Bracken growing in sandy soil in an Oak-Birch wood on the Gritstone Plateau show an enormous development of stereom (fig. 31). The epidermis produces abundant hairs forming a thick felt-like covering. Beneath this is a band 2–3 cells deep with dark brown, greatly thickened and pitted walls, succeeded by a broad yellowish-brown band 9–10 cells deep, and with strongly thickened walls forming a well-marked stereom-band containing little starch (fig. 32). Between this and the outer steles are several few-celled stereom groups. The stereom between the outer and inner steles forms often a complete ring and extending outwardly between them. The walls are dark brown, very strongly thickened and pitted, the cavities greatly reduced and containing few or no starch-grains. In addition to this, each of the outer steles is bounded on its outer side by a well-marked

Figs. 29–32.



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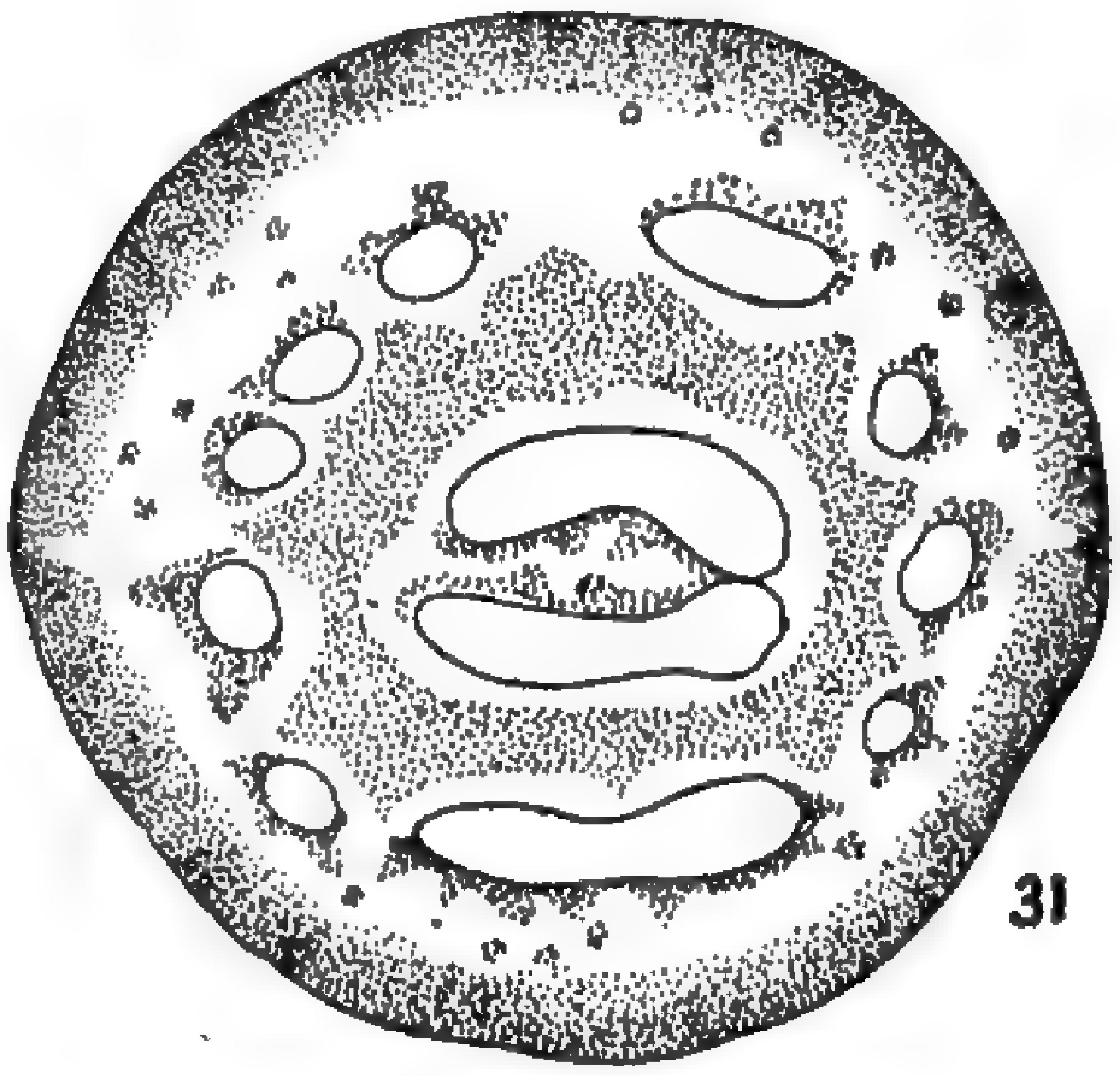

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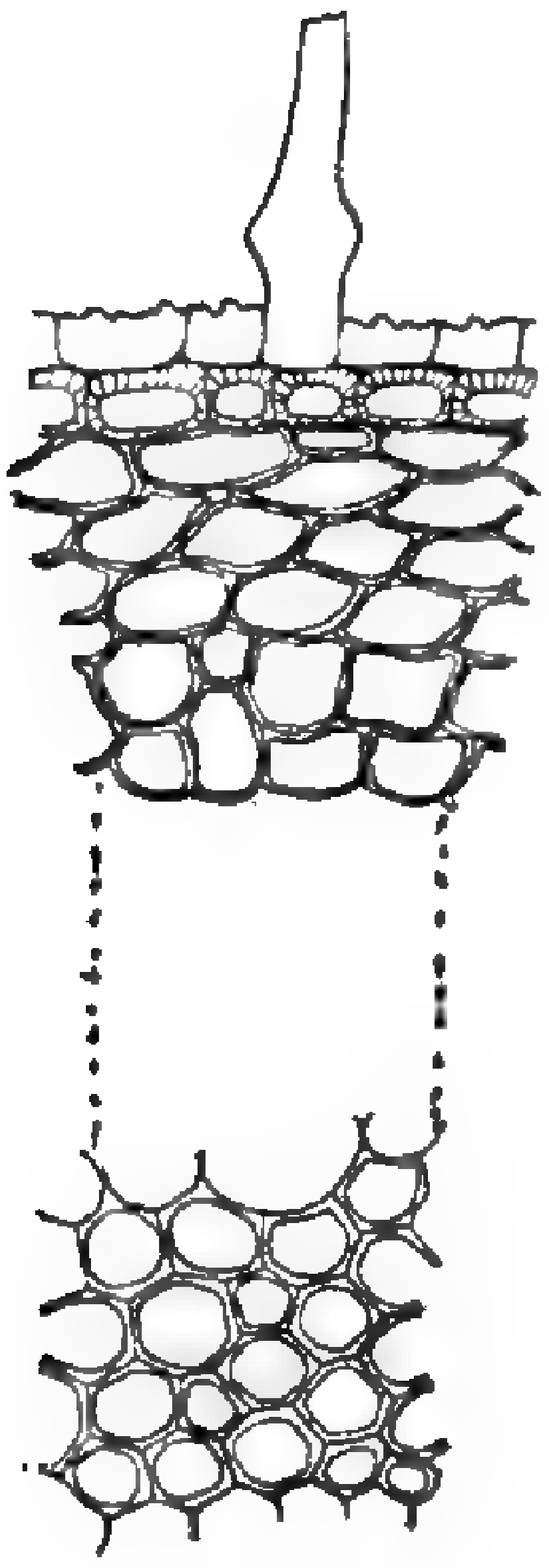

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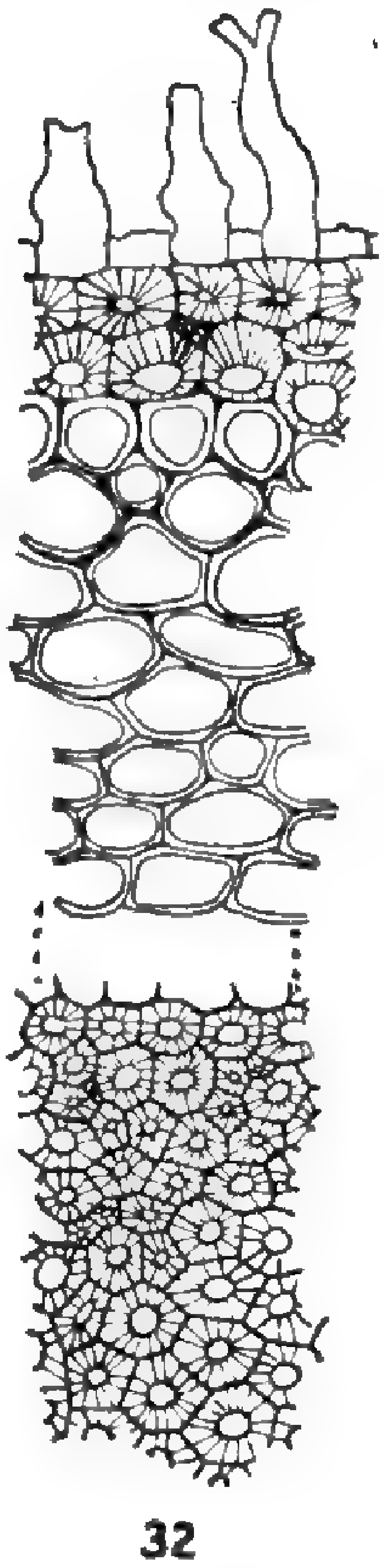

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Fig. 29. T. S. rhizome of *Pteris aquilina* growing under the shade of Beech.

30. T. S. portion of 29×150 diam. showing weakly-developed stereom.

31. T. S. rhizome of *P. aquilina* from a plant growing in an exposed situation in dry sandy soil.

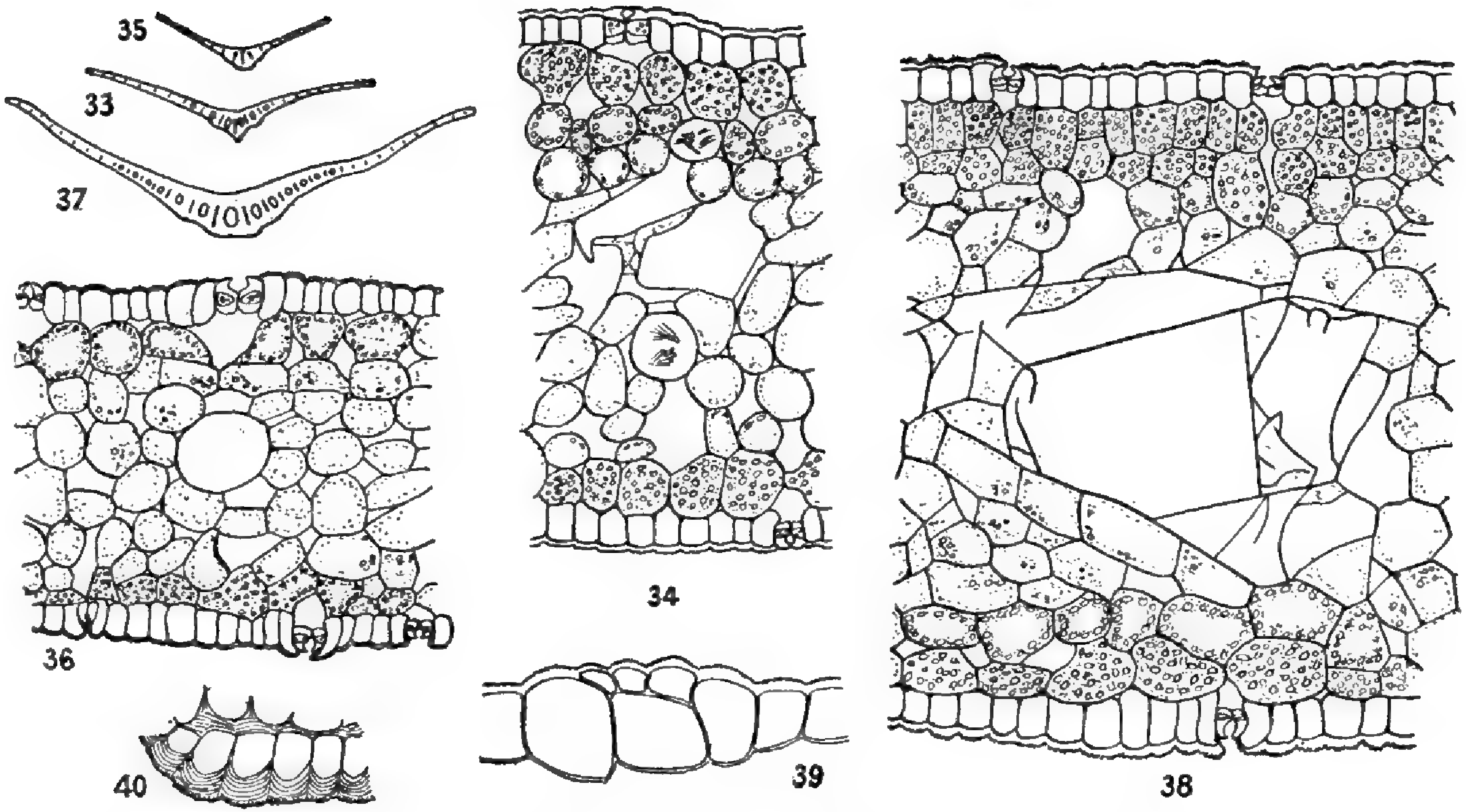
32. T. S. of 31 showing strongly-developed stereom. ×150 diam.

stereom-band 2–3 cells deep, and an almost complete stereom-plate is formed in the centre between the inner steles. On the steep slopes in the transition region every gradation between these extremes is found as we pass from the dry exposed gritstone summit over the moister sheltered areas of the shales and clays, the rhizomes reaching their maximum development and possessing the greatest storage capacity in the moist Oak woods in moderate shade. The observations of Blackman (5 A), Brown (9 A), and others show that shade-leaves assimilate more in the shade than sun-leaves in the shade. Under these circumstances, much starch will be produced by the shade-plants and a considerable storage-tissue required. A comparison of the rhizomes of *Pteris* growing under different conditions shows, as we have seen, that under moderate shade the rhizomes attain their greatest development and possess the greatest amount of storage-tissue; while plants growing under xerophytic conditions have on the whole thinner rhizomes, but a great development of stereom, and therefore a correspondingly reduced starch-storage tissue. The maximum of storage-tissue, *in proportion to the diameter of the rhizome*, I found in plants growing in deep shade.

SCILLA FESTALIS, Salisb. Bluebell or Wood Hyacinth.

This species obtains its maximum development in this district in the moist Oak and Sycamore woods on the Coal-Measure shales and clays. A typical leaf of a plant from these woods (fig. 33, p. 380) is clear green, and characterized by the cuticle of the upper epidermis being fairly well developed and very slightly corrugated (fig. 34). Beneath this are two rows of cells with abundant chlorophyll corpuscles, and in the remaining cells the corpuscles are very few or absent, except a single layer beneath the lower epidermis where they are abundant. Air-spaces are well developed in the mesophyll, and running through the centre of it is a nearly continuous line of clear rounded cells. Between the three bundles, on either side of the midrib, are lacunæ. The position of each lacuna is indicated at an early stage in development by a colourless rounded cell. This increases considerably in size, is very thin-walled, and eventually breaks down; in some cases, especially adjacent to the midrib, some of the neighbouring cells are involved.

Plants growing in the deep shade of a Beech wood present a sickly appearance, often showing traces of partial etiolation.



Figs. 33-40.—Leaves of *Scilla festalis* from plants grown under different conditions.

Fig. 33. T. S. of a typical leaf from a moist Oak wood.
34. T. S. of ditto × 150 diam.
35. T. S. of leaf growing under shade of *Fagus*.
36. T. S. of ditto × 150 diam.

Fig. 37. T. S. of leaf grown in a sunny situation.
38. T. S. of ditto × 150 diam.
39. Showing formation of hypodermis.
40. Showing much thickened epidermal cells of midrib.

The leaves are much narrower and thinner (fig. 35) than in the typical form and yellowish green in colour. The cuticle is very thin and not corrugated; a single layer of green cells is developed beneath each epidermis (fig. 36), chlorophyll granules being few and scattered in the remaining cells. A clear rounded cell is seen between the vascular bundles, but lacunæ are not developed. The inflorescence, too, is weak, the scape being slender and few-flowered, and these are of a pale blue colour.

Outside the woods the plant nowhere forms extensive masses in this area, occurring chiefly on the sites of previous woods and hedges and in hedgerows. Here the leaves are much darker in colour, broader and thicker than in the woodland forms (fig. 37). The epidermis has a thick lamellated cuticle and is distinctly corrugated (fig. 38). Occasionally leaves were found where the epidermis was locally two cells deep (fig. 39), the lower ones forming a large-celled aqueous hypodermis. The stomata are usually deeply sunk. The mesophyll is better developed, with fewer air-spaces, and two rows of cells beneath each epidermis contain abundant chlorophyll corpuscles. In the region of the midrib the lacunæ are very large, and occur between the bundles on either side up to the fourth or sixth bundle: here the cuticle is greatly thickened (fig. 40).

Leaves collected on April 7th showed the first division of cells to form an abciss-layer. This is found just where the leaf thickens to form the bulb-scale, and is easily seen with the naked eye as a well-defined dark line along which the leaf readily breaks (fig. 41). A longitudinal section through the abciss-layer is shown in fig. 42. Its development proceeds slowly and is accompanied by the decay of the leaf; the first evidence of this

Figs. 41 & 42.

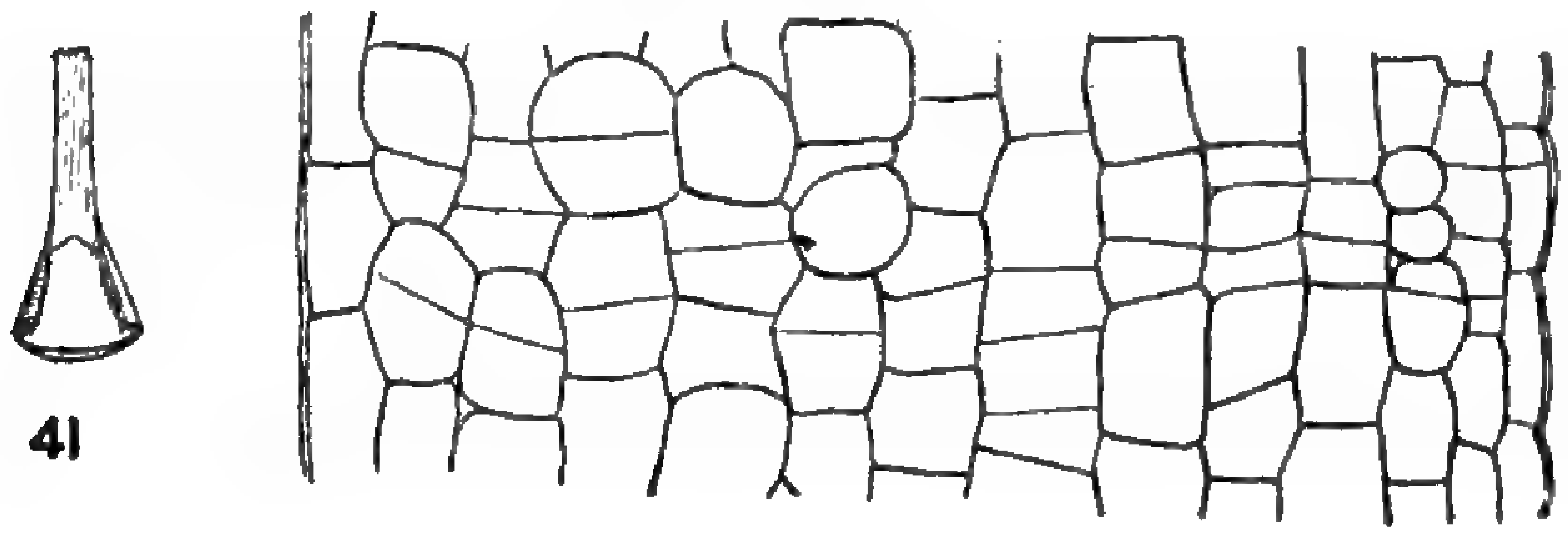


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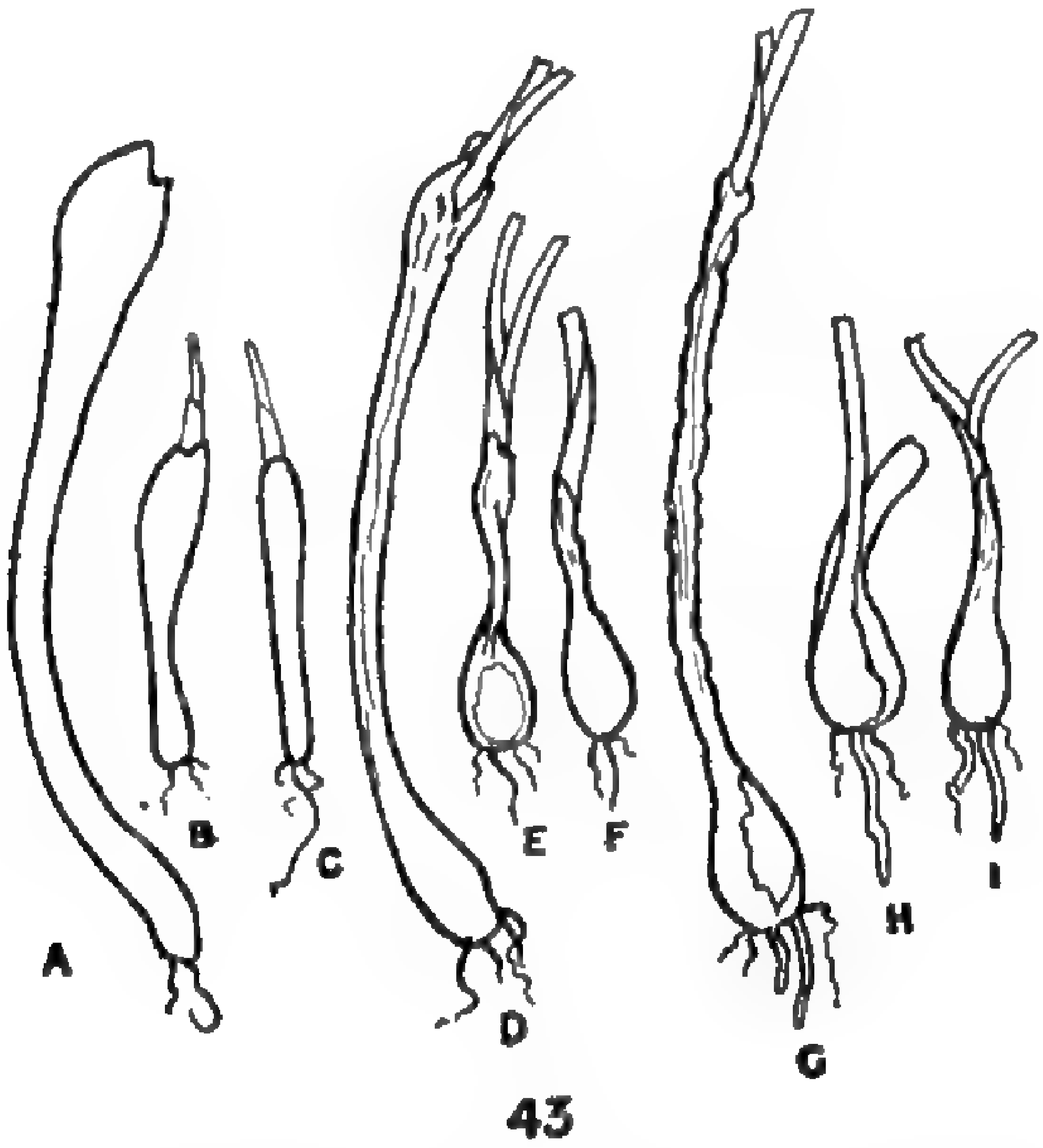
Fig. 41. Base of leaf of *Scilla festalis*, showing abciss-layer.
42. Abciss-layer of *Scilla festalis*. Longitudinal section.

is seen at the tip, which turns yellow and gradually extends to the base. Eventually it is cut off by a thin line of cells with corky walls, and thus decay below the abciss-layer is arrested. In the meantime its base has become swollen with reserve materials and forms a bulb-scale, the contents of which are practically unfreezable. With the means at my command I was unable to secure the freezing of these cell-contents; this is a feature of some interest in species producing leaves and flowers at such an early season. Comparatively few observations seem to have been made on the abciss-layer of Monocotyledons, but the details in *Scilla* agree very closely with those observed by Parkin (77) in leaves of *Narcissus*, *Galanthus*, and *Leucojum*.

As I have previously shown, the bulbs of *Scilla* are often curiously elongated, and a number of experiments have been carried out and observations made with a view to determine their fate. The results of one series of experiments are illustrated in fig. 43, which shows three bulbs in three stages of development. A, B, & C represent their appearance at the commencement of the observations on March 2nd. These were placed in moist cocoanut fibre and examined at short intervals. By April 11th, changes indicated at D, E, F had occurred.

Fig. 43.



A, B, C. Three elongated bulbs of *Scilla*, March 2nd.
D, E, F. The same bulbs as they appeared on April 11th.
G, H, I. Ditto on April 26th.

The foliage leaves had grown considerably in each case, the outer fleshy scale-leaf deprived of its nutrient materials had collapsed, the bases of the inner leaves had thickened, and at E had burst the base of the wrinkled outer scale. These changes continued, and by April 26th, as seen at G, H, I, the outer scale had almost disappeared, leaving behind the usual oval bulb. At the base of each bulb, roots of two kinds were now formed—(*a*) several slender fibrous roots, and (*b*) thicker more fleshy roots; two of the latter are shown in G, one each in H and I. These elongate and thicken considerably, and become eventually contractile.

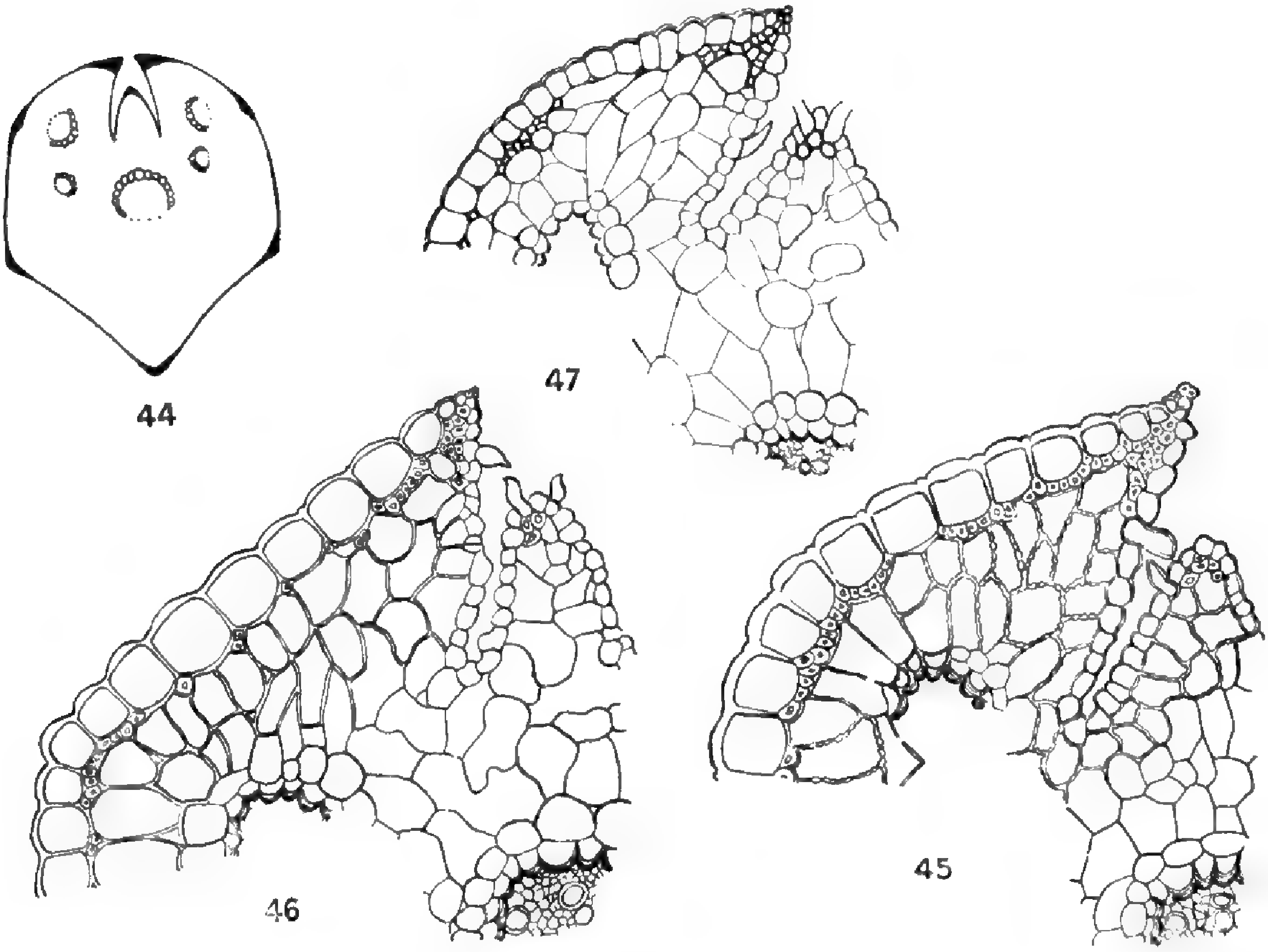
DESCHAMPSIA FLEXUOSA, Trin.

This is a characteristic grass of the dry Oak woods in the Millstone-Grit area and in the Coal-Measure woods over sandstone. With *Festuca ovina* and *Nardus stricta* it dominates the dry grass-heaths, and in such exposed sunny situations forms dense wiry tussocks. It is much less abundant, giving place to *Holcus mollis*, on the Coal-Measure shales, and occurs, but very sparingly, even on stiff clay. It is the most extremely modified of our xerophytic grasses, and an excellent account of it and other xerophytic forms has been given by Miall (67). Its leaves are relatively short, wiry, permanently inrolled and nearly circular in transverse section, with only a narrow groove along the upper surface (fig. 44, p. 384). The epidermal cells of the lower surface are large and covered by a thick cuticle with distinct ridges over the wedge-shaped lateral walls (fig. 45). Beneath this epidermis is an almost continuous stereom, being two or more cells deep along the angles, the fibres of which are thick-walled with only a small cavity. The cells of the upper epidermis within the groove are slightly thickened, the stereom beneath this being confined to a narrow band in the central ridge over the midrib. Two or more layers of the cells of the mesophyll are also thickened and pitted. The inner and radial walls of the endodermis are very strongly thickened, especially beneath the phloem, where a band for a distance of 2 or 3 cells on either side of the median line is two cells deep.

When growing in the medium shade of an Oak wood this species has a characteristic habit. Its leaves are longer, arching and interwoven in such a way that the plants produce nest-like hollows in which humus collects. In structure (fig. 46) the leaf differs from the heath-form in that the epidermis has rather thicker walls, the stereom beneath is discontinuous, the fibres are smaller with a tendency to form chiefly under the lateral epidermal walls, being continuous only at the angles. Similarly, the walls of the mesophyll and endodermis are thinner.

When growing in moist situations in the deep shade of Elm and Beech, as it frequently does on the wooded hill-slopes, its leaves are more slender, limp, and all tend to droop in one direction. In transverse section (fig. 47) the epidermal cells are seen to be smaller, with a thin cuticle, the stereom is discontinuous, the fibres are only slightly thickened, and the cells of the mesophyll are thin-walled. In the endodermis a cell

Figs. 44–47.



Leaves of *Deschampsia flexuosa* from plants growing under different conditions.

Fig. 44. Diagram of Transverse Section.
45. Portion of Trans. Sect. Sun-form.
46. Portion of Trans. Sect. Oak-wood form.
47. Portion of Trans. Sect. Under shade of *Ulmus* and *Fagus*.

beneath the phloem has strongly thickened inner and radial walls, in sharp contrast to the remaining endodermal cells.

Holcus mollis, Linn.
Quick or Creeping Soft-Grass.

This species, one of many studied by Lewton-Brain (59), is given by him as characteristic of waste and sandy places, but in the area under consideration, while it does occur in such situations, it reaches its maximum development in the moist Oak woods of the Coal-Measures, being a common associate of *Scilla* and *Pteris*. It extends into the Gritstone woods, where it competes with *Deschampsia flexuosa*, giving place to it in the drier woods and at higher levels. It is also common in open, sunny, dry situations such as roadsides and waste places.

In these varied habitats it differs strikingly in form. In moderate shade in the moist Oak woods its leaves are broad, gently curved, limp, and slightly hairy; in dry sunny spots they are erect, much shorter, narrower, more acuminate and hairy, the plant also flowers much more freely than when in the shade. On the steep wooded slopes when overshadowed by a close canopy of Sycamore or Elm, and thus brought under the influence of oblique or horizontal light, its leaves become longer, broader, thinner, much less hairy, and sharply reflexed at the base of the blade, the young shoot above showing a tendency to die early and flowers are not developed.

Fig. 48 (p. 386) is a transverse section of the erect-leaved sun-form. The epidermis has a firm cuticle, short stiff hairs are frequent, the stomata are deeply sunk, and motor cells are well developed. The cells of the mesophyll are closely packed and contain abundant chlorophyll granules.

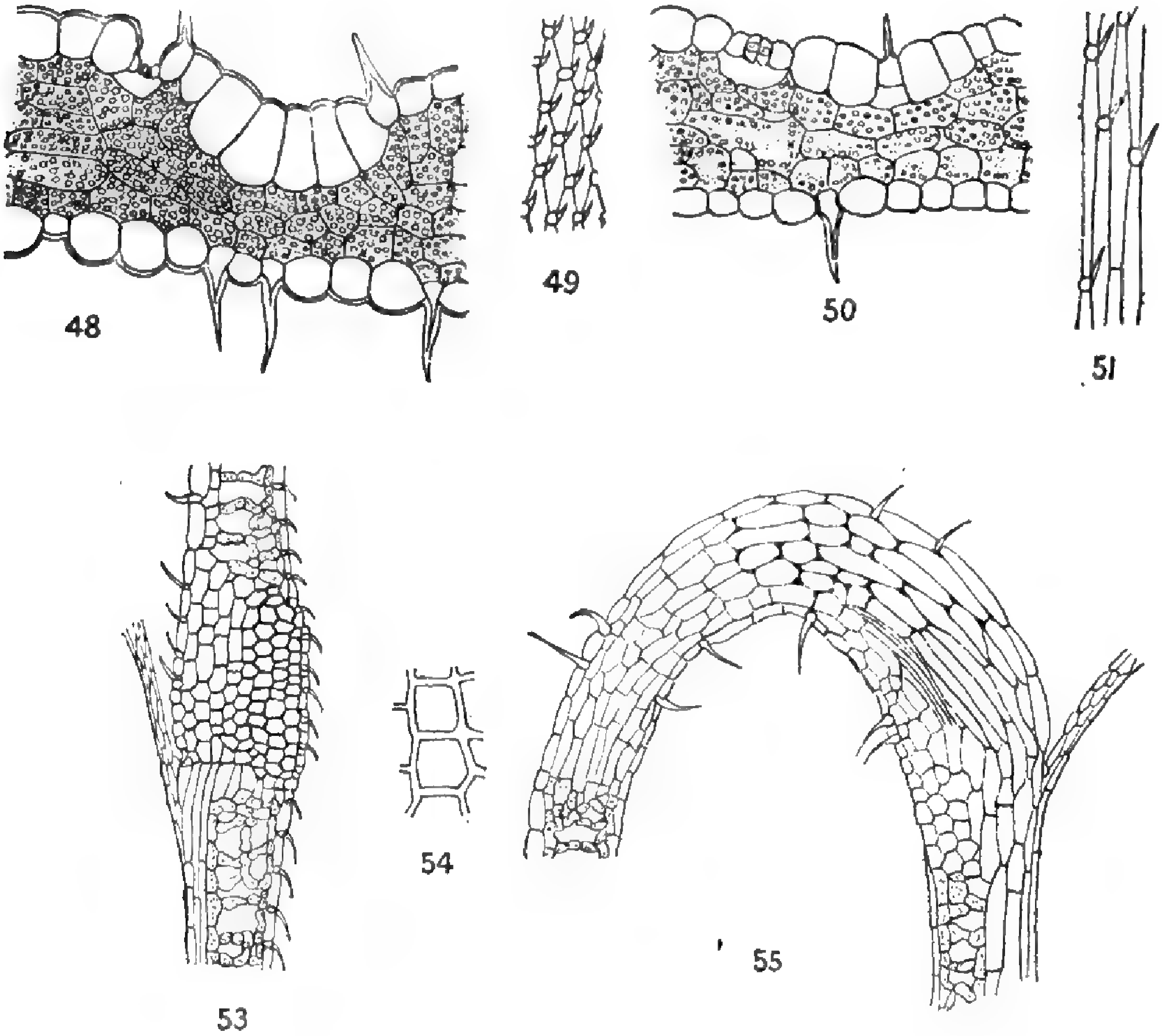
Fig. 49 shows a portion of the lower epidermis, where the hairs are seen to alternate with relatively short epidermal cells.

Fig. 50 shows a similar section of a reflexed shade-leaf. The epidermal cells are smaller and thin-walled, the stomata are not sunk, the chlorophyll granules are less abundant in the mesophyll, and the motor cells are not so well developed.

Fig. 51 shows a portion of the epidermis of this form. The epidermal cells are elongated to such an extent that the hairs are separated by considerable intervals; this, together with the act that hairs are less frequently produced, accounts for the very perceptible difference with regard to hairiness in the two forms. Stomata (fig. 52) are more abundant and are not sunk as in the sun-form.

A comparison of longitudinal sections through the base of the blade at the point where it joins the sheath shows interesting modifications in the two forms.

Figs. 48–55.



Leaves of *Holcus mollis* growing under different conditions.

Fig. 48. Sun-form leaf in Trans. Sect.
49. Lower epidermal cells of ditto.
50. "Shade"-leaf of *Holcus mollis*, reflexed form. Trans. Sect.
51. Lower epidermal cells of ditto.
52. Stomate of ditto.
53. Longitudinal Sect. base of blade of erect leaf-form.
54. Thickened cells of ditto.
55. Longitudinal Sect. base of blade of reflexed leaf-form.

Fig. 53 is such a section of the erect sun-form. The cells of the base are clear and transparent, and stand out sharply from the chlorophyllaceous cells above and below. Towards the lower surface the cells are small, four- or five-sided in section, and for about four rows in depth distinctly thickened (fig. 54), forming a shield-like stereom-plate. Towards the upper surface the cells are thinner-walled and rather larger.

Fig. 55 is a section through the base of the blade of the reflexed shade-form. In this we see that the blade has been bent over by the great elongation of the cells of the upper surface, many of which show distinct collenchymatous thickening.

As Schimper points out (83), a plant strives in various ways to obtain an ecological optimum of light. *Holcus mollis* affords an interesting example of this. In sunny situations it assumes an erect sun position. In the somewhat diffuse light of an Oak wood its leaves curve in such a way as to expose their flat surfaces to light; and when growing under trees where the light above is practically cut off, but strikes the plant obliquely or horizontally, its blades become strongly and permanently reflexed, and their flat surfaces exposed to the direction of the incident rays.

VACCINIUM MYRTILLUS, Linn. Bilberry.

This species is especially abundant in the open Pine woods * of the Millstone-Grit area, and in the dry Oak and Birch woods it forms, together with *Calluna* and *Deschampsia*, the dominant vegetation of the undergrowth. It quickly dies out over the Coal-Measure shales and clays, and under the deep shade of Sycamore, Elm, and Beech, being confined in this area mainly to the drier soils over sandstone. To the west, it extends beyond the limit of the woods, is abundant along the dry moor edges and slopes, but is displaced to a large extent by cotton-grass (*Eriophorum vaginatum*) on the deep ill-drained peat, to reappear again in somewhat extensive masses on the hill-summits at 1600 feet and upwards.

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* During a recent tour in the Eastern and Swiss Alps, I was much struck by the habit of this species in the Spruce forests. Here it grows in forests of such density as appear to be fatal to it in the Huddersfield district, probably owing to the density of the smoke-cloud characteristic of this part of West Yorkshire; whereas the intense sunlight of the Alps penetrates the forests sufficiently to favour its development, but it assumes a very characteristic habit: it forms flat branched plates, all the leaves exposing their upper surfaces to the light, being a very striking shade-type. While the plants growing in the open have their branches more erect, the leaves are erect and parallel to the stems and so expose their edges to the light, a typical sun-habit.

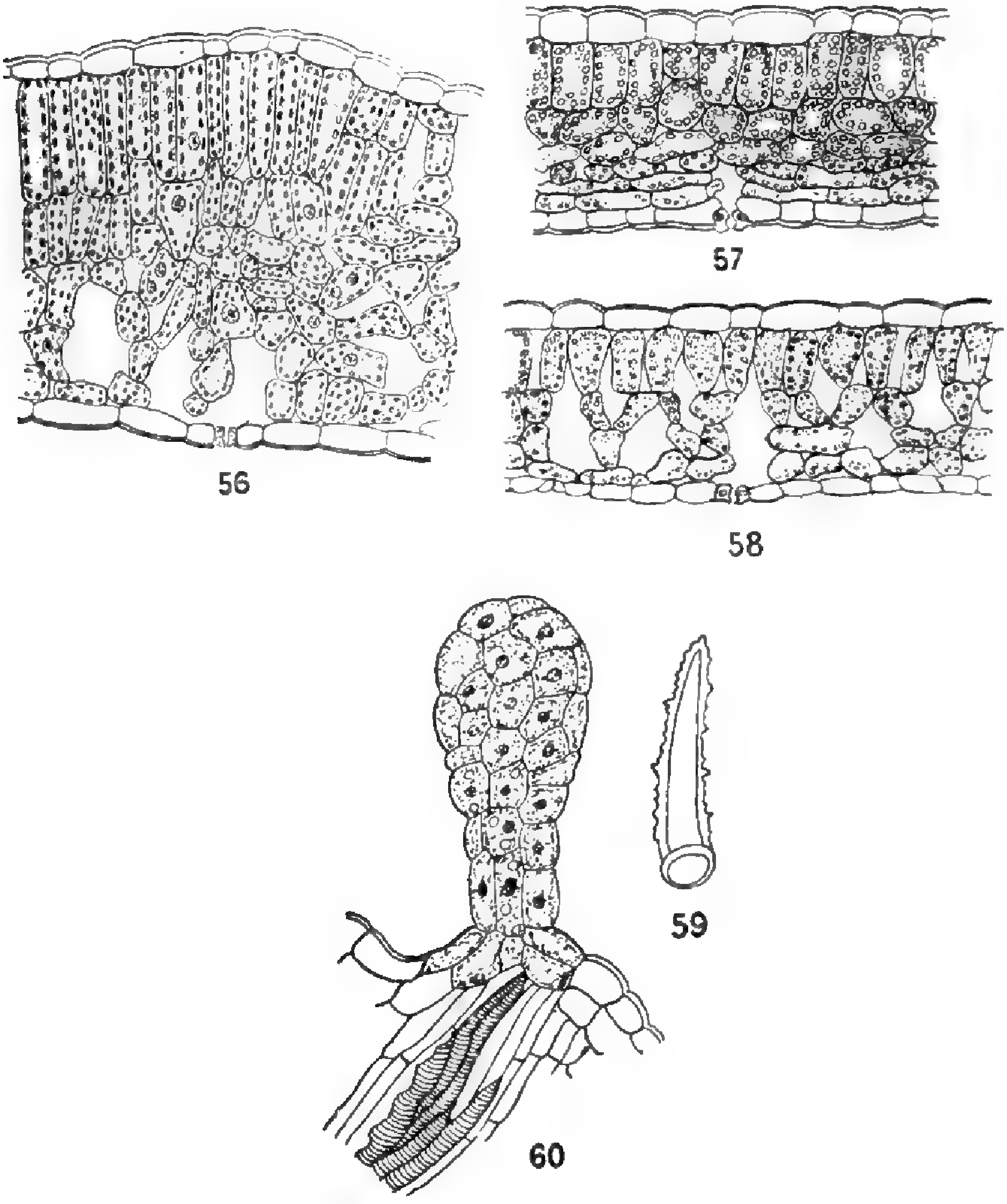
In these different situations the plant varies much in size. Typically from one to two feet in height, it may, in exposed windy situations and in a shallow soil deficient in humus, be not more than two to three inches in height, as on the western grassy slopes of Meltham Cop and at Cheese Gate Nab. Here the stem is much branched, very thin and wiry, and the cuticle of the epidermis much thicker than that of the taller larger plants. The internodes are greatly reduced, and in consequence the leaves, though very small ($\frac{3}{8} \times \frac{1}{8}$ inch), become much crowded together, so offering mutual protection. This dwarf form is of frequent occurrence in places where the soil is relatively dry and deficient in humus. Schröter (84) figures similar differences in *V. Vitis-idæa* and *V. uliginosum*, the small-leaved form of the latter species having received the name var. *microphyllum*.

Plants growing in very exposed situations frequently develop brown or red pigments, which, as Kerner (52) and others have pointed out, is a common feature in leaves exposed to cold and intense light. Overton (76) has shown that these red pigments were produced under the influence of cold; and Stahl (91) previously made the interesting observation that portions of leaves containing such pigments had, when illuminated, a higher temperature than parts not so coloured; and Rathay (80), Wiesner (104), and others have shown that transpiration is less in red than in green leaves. This sequence of events is interesting: that cold produces in leaves pigments which, under the influence of light, occasion compensatory warmth, and such leaves have also a reduced transpiration, all features of great value to a plant exposed to xerophytic conditions. In different species these pigments are produced under various, even opposite conditions, as shown by Katić (51), to whose paper, also to Buscalioni & Pollacci (11) and Czapek (21), reference may be made for literature and full consideration of the subject.

Fig. 56 shows a transverse section of a leaf of the high Moorland-form; the epidermis is strongly cuticularized, and the double row of palisade-cells well developed, the upper ones being much elongated and occupying nearly half the thickness of the leaf. Stomata are abundant on the under surface, but very few on the upper surface, and here they occur chiefly in the neighbourhood of the veins. In extreme forms from very exposed, sunny and dry situations no stomata were found on the upper surface, while they were numerous on both surfaces in the shade-forms.

Fig. 57 is a section of a very small leaf from the dwarf form, which scarcely rises above the short grass among which it grows. The leaf is thinner than the previous type, but has a very compact mesophyll—a feature of importance in reducing transpiration.

Figs. 56–60.



Leaves of *Vaccinium Myrtillus* growing under different conditions.

Fig. 56. T. S. leaf of typical Moorland form.
57. T. S. leaf of dwarf small-leaved form.
58. T. S. leaf of Woodland shade-form.
59. Hair of leaf.
60. Multicellular gland of leaf.

Fig. 58 is a section of a leaf from the form growing in a sheltered Oak wood on the Millstone-Grit escarpment. The leaf is much larger but thinner than the previous forms; the upper epidermis is very slightly cuticularized, air-spaces are frequent in the palisade-layer and large in the spongy parenchyma. The chlorophyll granules are less abundant than in the two previous forms, and the leaf is distinctly paler, and, as above stated, stomata occur abundantly on both surfaces.

The leaf of the Bilberry is usually described as glabrous, but close examination shows that on both surfaces, especially on the upper surface, are numerous unicellular hairs with thick and warted walls (fig. 59). In addition to these, each tooth of the leaf-margin is terminated by a clavate multicellular hair with thin walls, and, when young, filled with finely granular contents (fig. 60). At the base of each hair ends a fine veinule. In an old leaf the contents turn brown and the hairs become shrivelled. These hairs are usually curved in such a way as to apply their apices to the upper surface of the leaf. A few are also found on both upper and lower surfaces chiefly over the veins; they also occur on the margin and near the base of the slightly channelled petiole. The contents are readily plasmolysed by a solution of sodium chloride, and they soon regain turgidity in water, showing their walls to be permeable. Experiments similar to those described by Pfeffer (78), Gregory (39), and others suggest them to be capable of absorbing water. Hairs occur on the under surface and on the leaf-margin of *Vaccinium Vitis-idæa*, and are stated by Lundström (61) and Kerner (52) to be absorptive. Lundström described many absorptive hairs, and in a list he gives the Bilberry is included. Wille (108) has shown, by means of a 1-per-cent. solution of lithium chlorate and subsequent spectroscopic examination, that many are capable of absorbing, but he sharply criticises Lundström's contention that they are "adaptive" structures; while Gregory (39), Schimper (83), and others have given numerous illustrations of hairs functioning as absorptive organs, some performing the double function of absorption and excretion. Drabble and Lake (24) have recently made some useful observations which bear directly on the point under consideration. In comparing the strength of the cell-sap of the epidermis of several species of plants growing under different conditions, they find, for example, that the cell-sap of *Geranium Robertianum* growing under moist conditions has a strength equal to a solution of sodium chloride having a concentration in gram-molecules of ·11, while the same species growing on rocks under xerophytic conditions had a cell-sap equal to ·18.

Vaccinium Myrtillus was one of the species they examined, and its sap had a density represented by ·23. Their assumption is a reasonable one, that a relatively high concentration of the cell-sap will favour the rapid absorption of water, and so be of service to plants growing under xerophytic conditions.

(*b*) SECONDARY AND SUBORDINATE SPECIES.

Other species have been examined whose distribution is more restricted; three of these, *Heracleum Sphondylium*, *Lamium Galeobdolon*, and *Mercurialis perennis*, are often locally abundant in the moist Oak woods of the Coal-Measures, and they show well-marked structural differences in different habitats.

HERACLEUM SPHONDYLIUM, Linn. Hogweed; Cow-Parsnip.

This species is of common occurrence in the moist Oak and Sycamore woods, especially in parts where the ground has been disturbed. It is also frequently met with in open sunny places, as in fields and banks. In the more exposed situations it is often less than a foot in height. Its leaves are much reduced in area, and are thick and hairy. Fig. 61 (p. 392) is a transverse section of such a leaf from a plant growing on the sandy soil of the Gritstone Plateau; the epidermis is seen to be strongly cuticularized and distinctly corrugated. In surface view the cells are oval or rounded and slightly wavy in outline (fig. 62). The cells of the palisade are very long and narrow, and consist of a single layer only, occupying more than half of the mesophyll. Below this is a layer of more rounded cells followed by two rows which are much elongated, and united in such a way as to form a characteristic network when seen in surface view.

Plants growing in the shade are not only taller, but the area of the leaf is greatly increased and is less hairy and very thin. The epidermal cells are larger and much more wavy in outline than in the sun-form (fig. 63), and they are very thin-walled. The cells of the palisade (fig. 64) are greatly reduced and are pear-shaped, exposing their broad upper surfaces to the light, and the air-spaces between them are large. Below this is a network formed by two layers of spongy tissue, and the cells of the lower epidermis are thin-walled and the stomata raised.

It has been shown by Noll (73) and Schimper (83) that plants growing in deep shade exhibit lens mechanisms in their epidermal and other cell-walls. While examining sections of the shade-form of *Heracleum*, it appeared that the curvature of the upper wall of the epidermal cell seemed to be directly correlated with the form of the palisade-cells below it. The general effect of this curvature is to produce a central area of increased, but not uniform, light intensity, which is bounded by a shadow; and as a consequence of this differential lighting the modifications in the palisade-cells seemed attributable. In the sun-form this boundary of shadow may be of service in protecting the chlorophyll corpuscles from the injurious effects of intense light, as the mechanism is such that the chlorophyll corpuscles may circulate in an area of relative shadow.

Figs. 61-64.

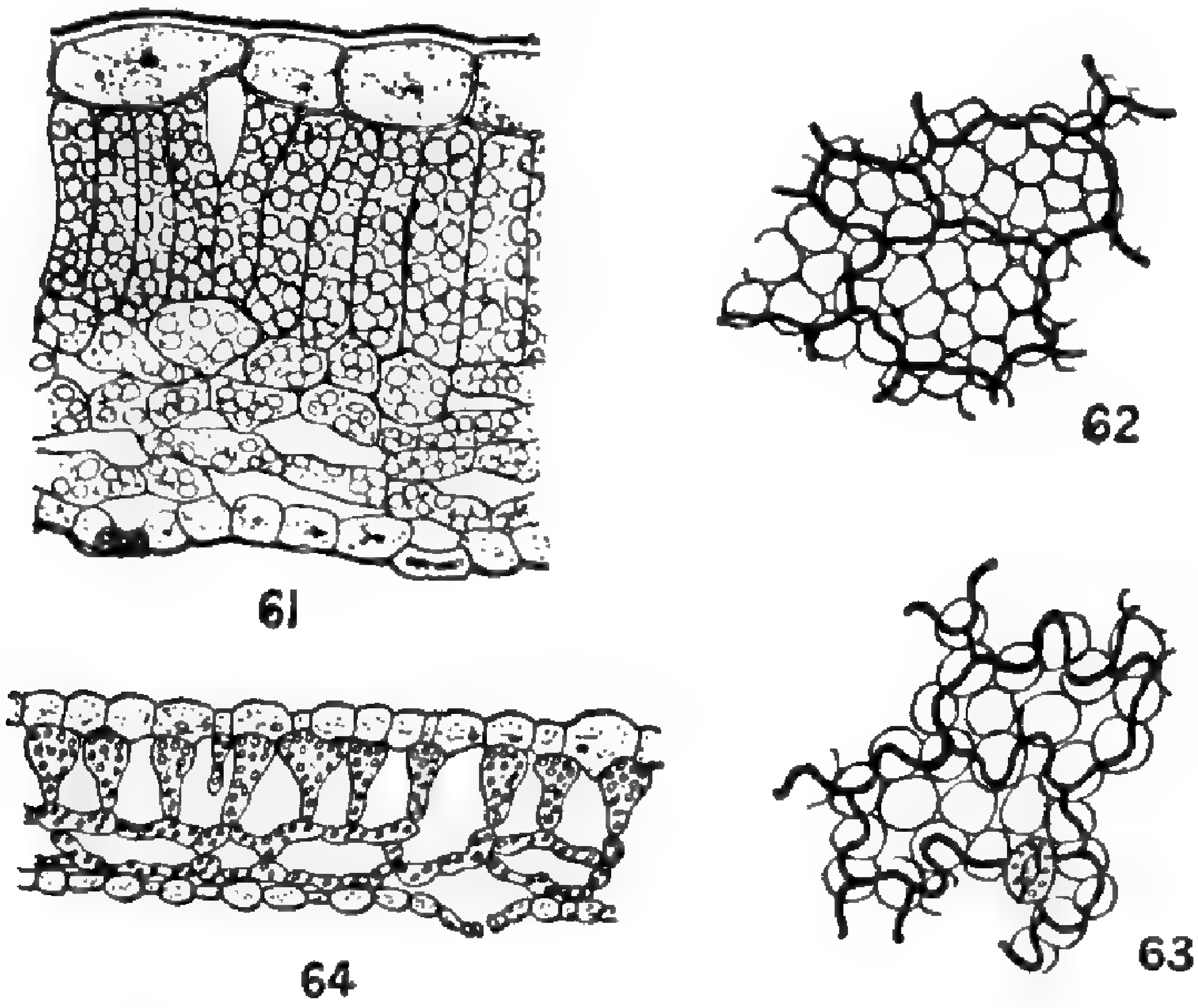
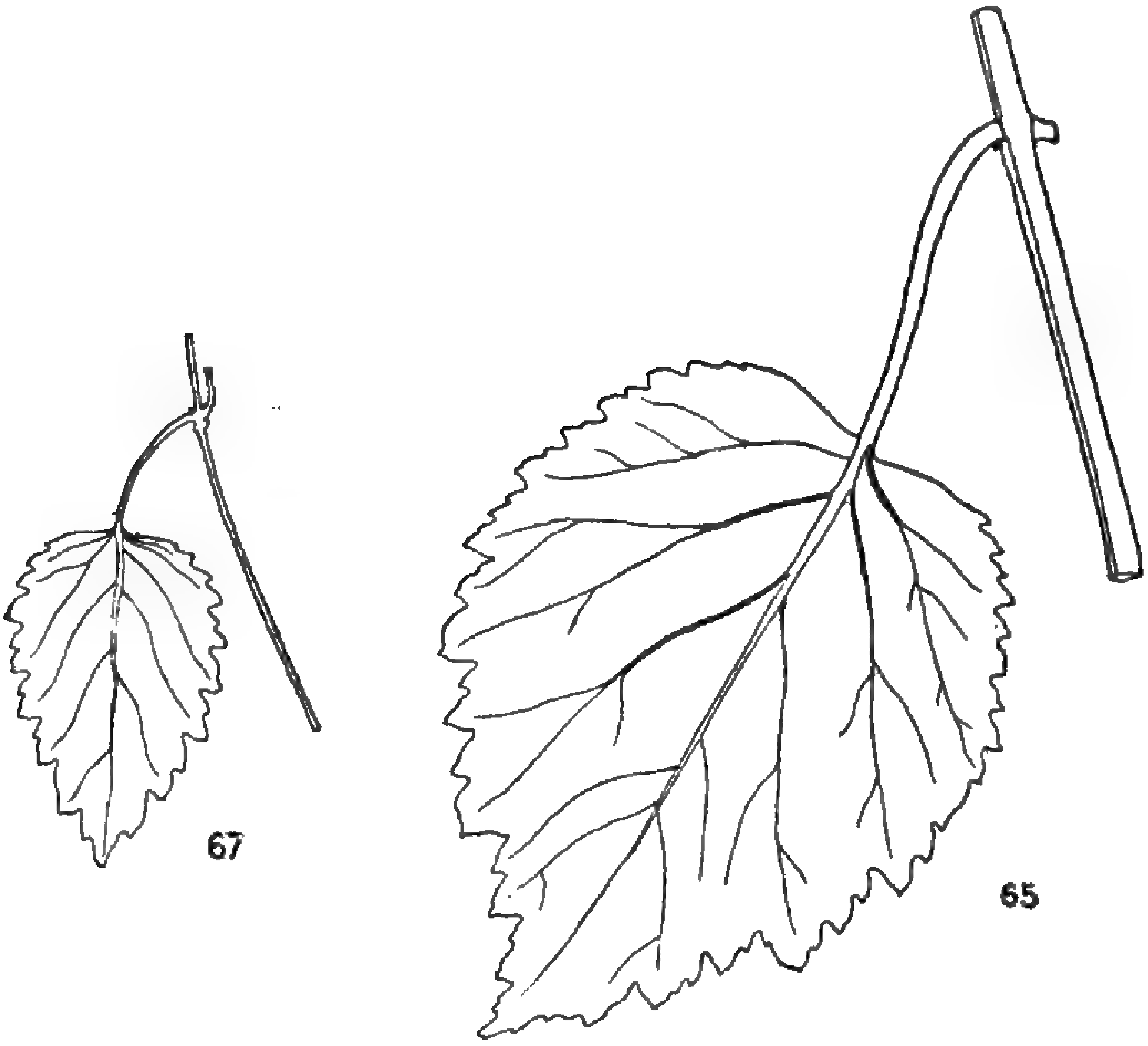


Fig. 61. T. S. "Sun"-leaf of *Heracleum Sphondylium.*
62. Surface view upper epidermis of ditto.
63. T. S. "Shade"-leaf of *H. Sphondylium.*
64. Surface view upper epidermis of ditto.

One of my students (Mr. J. W. H. Johnson), while kindly preparing sections for me, worked out in detail several interesting points with reference to these modified lens mechanisms, the results of which will be shortly published. Haberlandt's recently published monograph (41) gives an excellent exposition of the lens mechanisms of epidermal cells. The form in *Heracleum* is of a somewhat different type to those figured by Haberlandt, and more recently by Guttenberg (40) in *Adoxa*, &c.

Figs. 65-68.



"Sun" and "Shade" leaves of *Lamium Galeobdolon*.

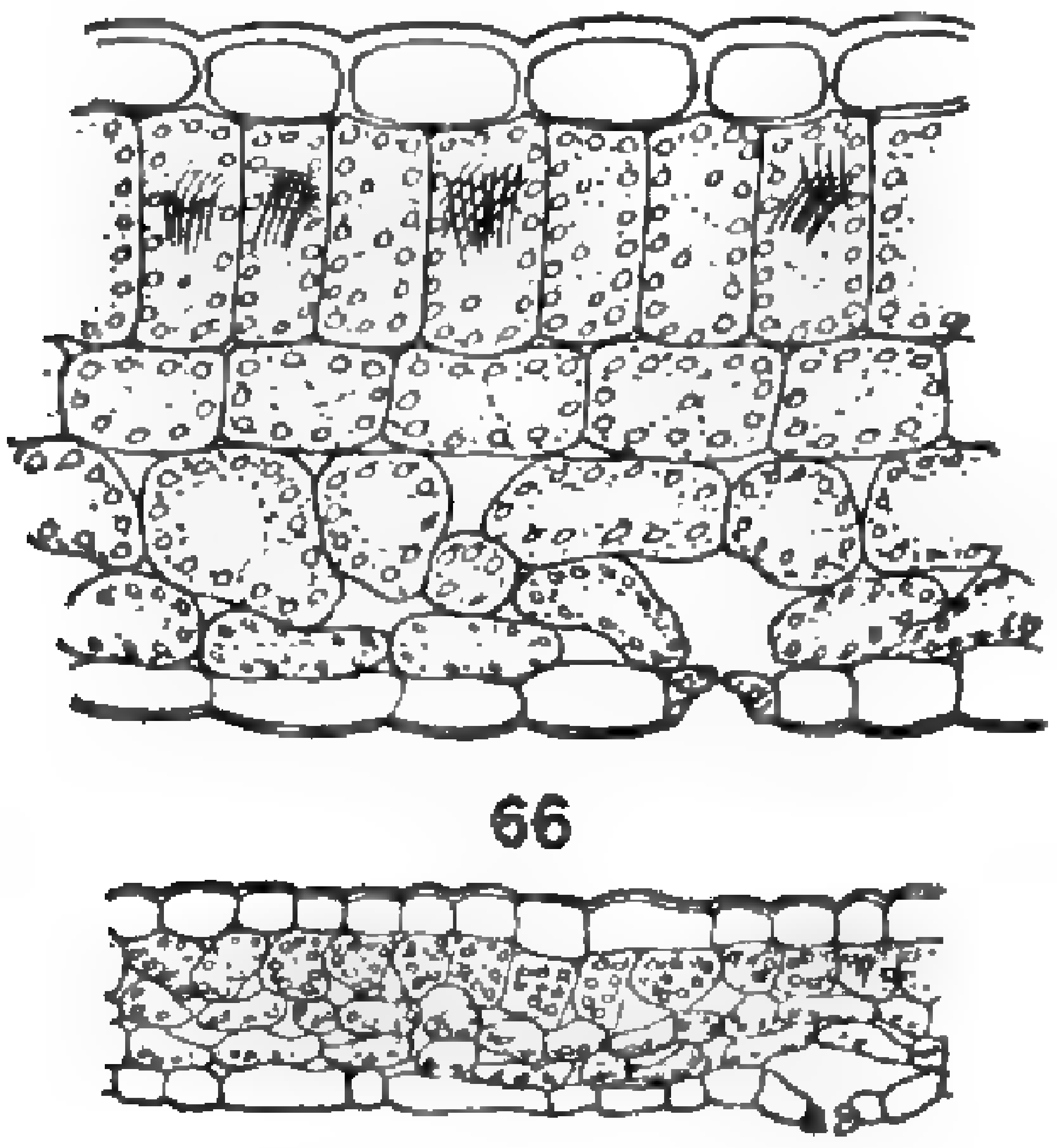


Fig. 66. Trans. Sect. of 65. From an open Oak wood.
68. Trans. Sect. of 67. From a plant growing under shade of Beech (*Fagus*).

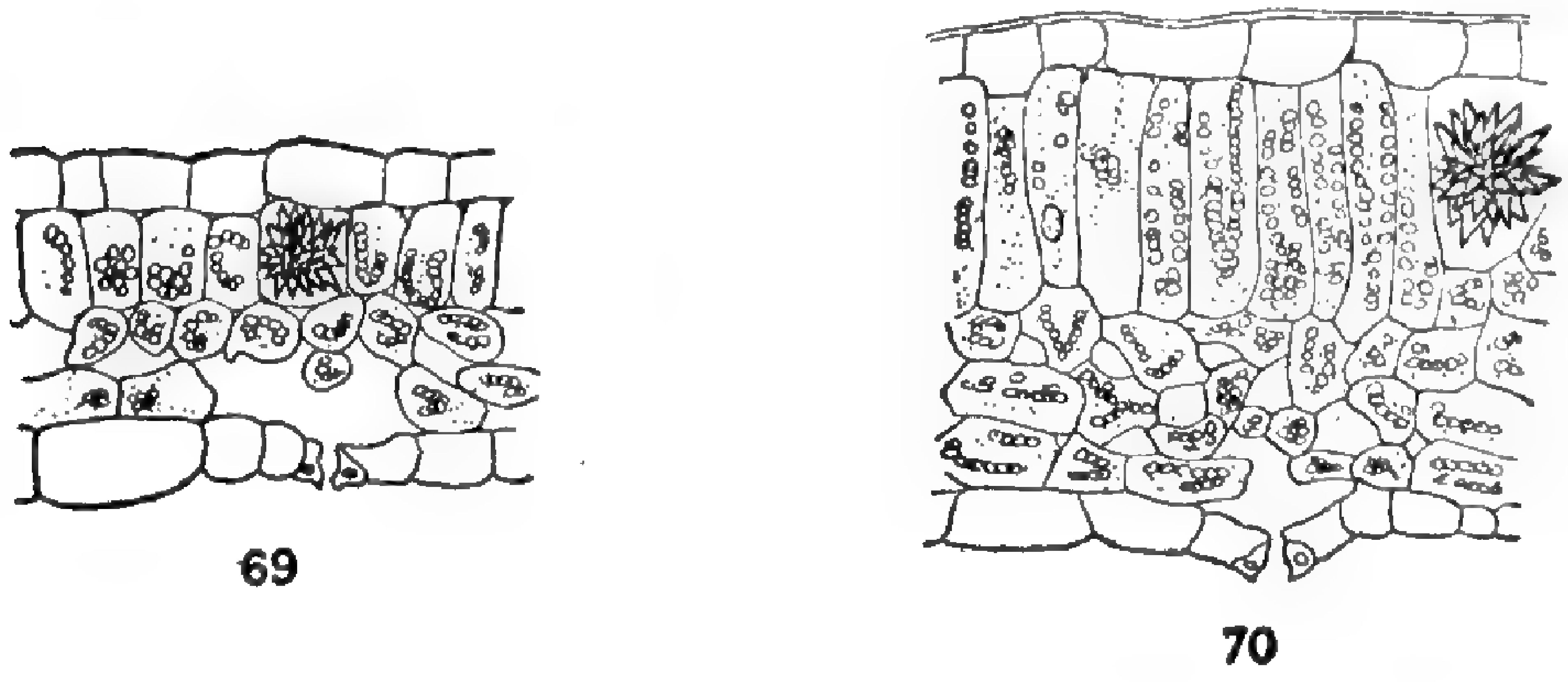
LAMIUM GALEOBDOLON, Crantz. Yellow Dead-nettle.

The effect of shade is very strikingly shown in both stem and leaf of this species. Fig. 65 shows in outline (reduced) a leaf from a plant growing in a moist open Oak wood. Fig. 66 is a transverse section of this leaf. The epidermal cells are strongly cuticularized in both outer, lateral, and to a less extent on their inner walls. The lower epidermis is slightly cuticularized on its outer wall; the palisade consists of large elongated cells frequently containing raphides. The cells of the spongy parenchyma are large and air-spaces are numerous. Fig. 67 shows in outline a leaf from a patch growing under the deep shade of Sycamore and Beech; the stems are long, very slender, and the plants prostrate, the leaves are very small and exceedingly thin. Fig. 68 shows a section of one of the leaves in which the cuticle is very thin and the cells of the mesophyll, although consisting of three layers, are exceedingly small and contain few or no raphides, while the stomata on the under surface are distinctly raised.

MERCURIALIS PERENNIS, Linn. Dog's Mercury.

This species not only occurs abundantly in damp woods, where large patches are developed due to its vegetative mode of increase, but is also a common plant of the hedgerows. Fig. 69 is a transverse section of a leaf from a shade-area of Sycamore and Elm on a damp, clayey soil. The epidermis is thin-walled; mesophyll reduced to three rows of cells; air-spaces relatively large, with frequent crystal sacs beneath the upper epidermis. The leaf is very thin.

Figs. 69 & 70.



Transverse sections. Leaves of *Mercurialis perennis.*

Fig. 69 from a leaf growing in a sunny situation.
Fig. 70 ,, ,, in shade of *Acer* and *Ulmus.*

Fig. 70 is a section of a leaf of the sun-form from a hedgerow. The upper epidermis is distinctly cuticularized; palisade-cells much elongated, displaced at intervals by crystal sacs; spongy parenchyma in three layers; air-spaces relatively small. The leaf is distinctly thicker and firmer than the shade-form.

SUMMARY.

The vegetation of the Huddersfield district is naturally divided into three parallel zones:—

(1) THE MOSS MOOR, a part of the Pennines ranging in altitude from 1700 to 1000 feet. Of the three zones it is the most exposed, the climatic conditions are extreme, the soil consists chiefly of deep ill-drained peat, on which *Eriophorum vaginatum* dominates with very few associates. On the higher, drier ridges and moor-edges, *Vaccinium Myrtillus* with ericaceous plants are dominant. Though now practically a treeless region, there is much evidence that forests of *Betula* &c. extended over a considerable part of it, and much buried timber is found at the base of the peat. At the present time *Quercus* dies out at 1200 feet. A characteristic vegetation of *Pteris aquilina* with xerophyte associates covers the hill-slopes and forms a transition region to Zone 2.

(2) THE MILLSTONE-GRIT PLATEAU occupies the central portion of the district, and the altitude ranges from 1000 to 500 feet. In contrast to the Moss Moor, it consists of a series of fine plateaus with a general dip to the south-east. The rocks consist mainly of coarse-grained, jointed sandstones, overlaid by shallow pervious soils and in parts by thin, relatively dry peat. It is fully exposed to the sun and drying east winds, and although the rainfall is moderately high (42 inches), water so readily percolates or is drained off that it is a typical, physiologically dry area, and the vegetation is consequently xerophytic; ericaceous plants and xerophytic grasses dominating. Oak is the dominant tree, with Birch and Pine. All the trees are planted, but often on the sites of primitive forest, and Oak was formerly much more abundant than at present in this zone.

(3) THE COAL-MEASURE AREA.—In general the altitude ranges from 500 to 200 feet, except to the south-east, where it

rises to 1200 feet. The rocks consist of fine-grained sandstones alternating with extensive deposits of shales and clays. The soils are often deep, frequently covered with much humus, and retain much water. Climatic conditions are medium, and although the rainfall is much lower (33 inches) than in Zone 2, owing to the nature of the soil water is more constant and the vegetation is mesophytic, except on soils over sandstone and in the higher parts, where xerophytes extend from the Gritstone Plateau.

In a district like the one under consideration, where Glacial deposits are absent, and soils owe their origin largely to the denudation of the underlying rocks, a solid-geology map is of great value when making a primary analysis. It has here been shown that a comparison between such a geological map and a vegetation map is very instructive and suggestive; that a change in geological formations and soil-conditions is accompanied by a change in plant-associations.

It has been shown that carefully selected small areas studied in detail, and the results shown on lines such as the present Wood-maps, help considerably to bring out the main factors affecting plant-distribution; and it is believed that such maps could be usefully introduced in connection with larger surveys to supplement the features illustrated in small-scale maps. The results indicate that the study of small associations will materially aid the study of plant-geography, and bring to light many interesting points in the life-histories of the species.

The present study indicates that, in this district, the physical properties of the soil and accompanying conditions play a more important part in determining the character of plant-associations and the distribution of species than the chemical composition of the soil.

The dominant elements of an association tend to form a biological unit, and in the case of the Meso-pteridetum (*Scilla, Holcus*, and *Pteris*) dealt with we have a *complementary association*, the subaerial parts being in, or tending to occupy, definite and different layers, *i. e.* edaphically complementary, and the aerial parts are seasonally complimentary.

On the other hand, we have in the Xero-pteridetum an association where the dominant species (*Vaccinium*, *Calluna*, *Pteris*, and

Deschampsia), owing to soil-conditions, occupy the same layer; and after we have made allowance for differences in food requirements, they still form a *competitive association*, and sometimes one, sometimes the other species gains the upper hand. In this connection very little work seems to have been done, and further study will doubtless lead to interesting results.

In studying the vegetation in the transition region from the relatively dry Millstone Grits to the moister Coal-Measures, we find that the line of demarcation, though evident, is not sharply drawn between the two biological types; but as the xerophytes invade the region of the mesophytes, and come under the mellowing influences of moisture and shade, increased temperature and greater protection, they tend to lose their xerophytic characters and take on mesophytic characters. The reverse also holds good—that as the mesophytes encroach on the xerophytes, and come under the influences of drier and more rigorous conditions, they develop xerophytic characters.

These changes in soil and other conditions act more completely as barriers to some species than to others, but in the case of species not so restricted in their distribution, differences in physiological water and food-supply, presence or absence of peat or humus, produce striking modifications in their form and structure (e. g. *Pteris* and *Vaccinium Myrtillus*).

The influence of the dominant tree determines in a varying degree the distribution of the species (e. g. *Pteris*), and not only affects the amount of transpiration in the plants of the undergrowth, but also brings about modifications in structure, resulting from the amount of shade produced and accompanying conditions, e. g. *Pteris, Scilla festalis, Deschampsia flexuosa, Holcus mollis, Heracleum Sphondylium, Lamium Galeobdolon*, and *Mercurialis perennis*—each showing well-marked sun and shade, xerophytic and mesophytic structures according to environment.

Variations in light-intensity or the direction of the incident rays not only affect the structure, but also the habit of the plant, e. g. *Holcus mollis* and *Vaccinium Myrtillus*.

The several species of an association vary considerably as to their power of adaptability, and therefore in their range of distribution, e. g. *Pteris* as compared with *Calluna*. In general the less plastic a species is, the narrower is its range of structural variation and the more restricted is its distribution.

Changes in structure are produced by varying degrees of exposure to which the species are subjected, the modifications being concerned largely with conserving water by checking evaporation, *e. g.* thick cuticle, reduced number of stomata, more compact mesophyll and hairiness; or the development of water-storage tissues. In some cases, hairs may function as water-organs, e. g. *Vaccinium Myrtillus*; or the modifications may be such as to provide a means of eliminating excess of water, *e. g.* thin cuticle, increased number of stomata, increased leaf-surface, larger intercellular spaces in the mesophyll, &c.

The tissues most susceptible are the epidermal and ground-tissues, and not only are those of the leaf-blade affected, but also those of the petiole and rhizome, e. g. *Pteris.*

Modifications occur which are of mechanical advantage to the plant in aiding it to resist stresses due to wind in exposed situations. Others are of advantage in supporting relatively large leaves on slender leaf-stalks developed in sheltered situations in deep shade, e. g. *Pteris.*

I wish to express my thanks to Miss H. M. Sikes, who has rendered much assistance throughout the work. I am also indebted to Mr. W. E. L. Wattam for help in mapping the distribution of species; to Messrs. J. W. H. Johnson and Edward Lodge for the trouble they have taken in making analyses of soils; to Miss B. Lomax for her great assistance in the preparation of sections and drawings; also to Mr. F. O. Mosley for help in the preparation of the maps.

I also wish to acknowledge my indebtedness to the Earl of Dartmouth and to Sir Thomas Brooke, Bart., for their kindness in permitting free access to the woods on their estates.

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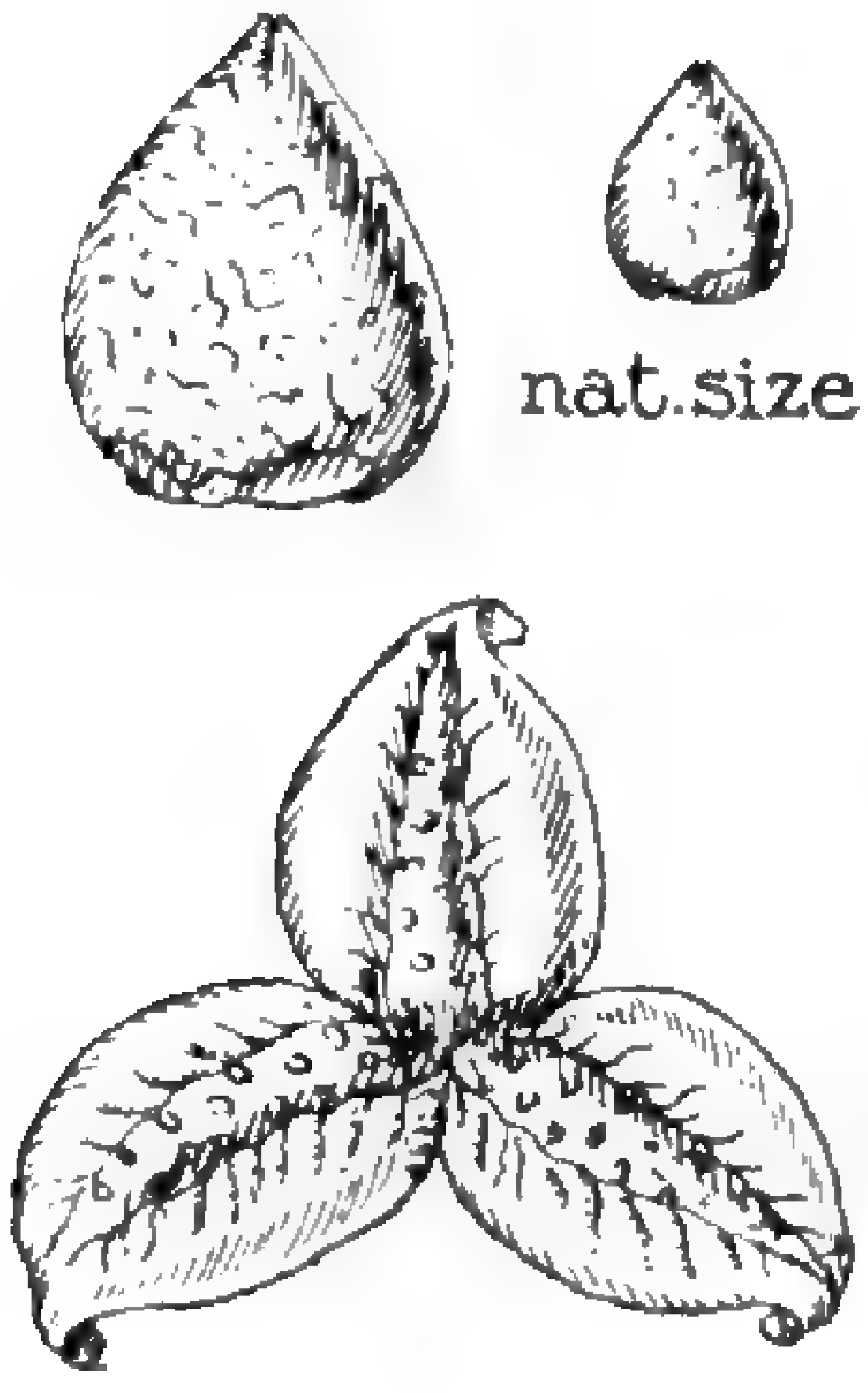
On Two New Species of *Populus* from Darjeeling.

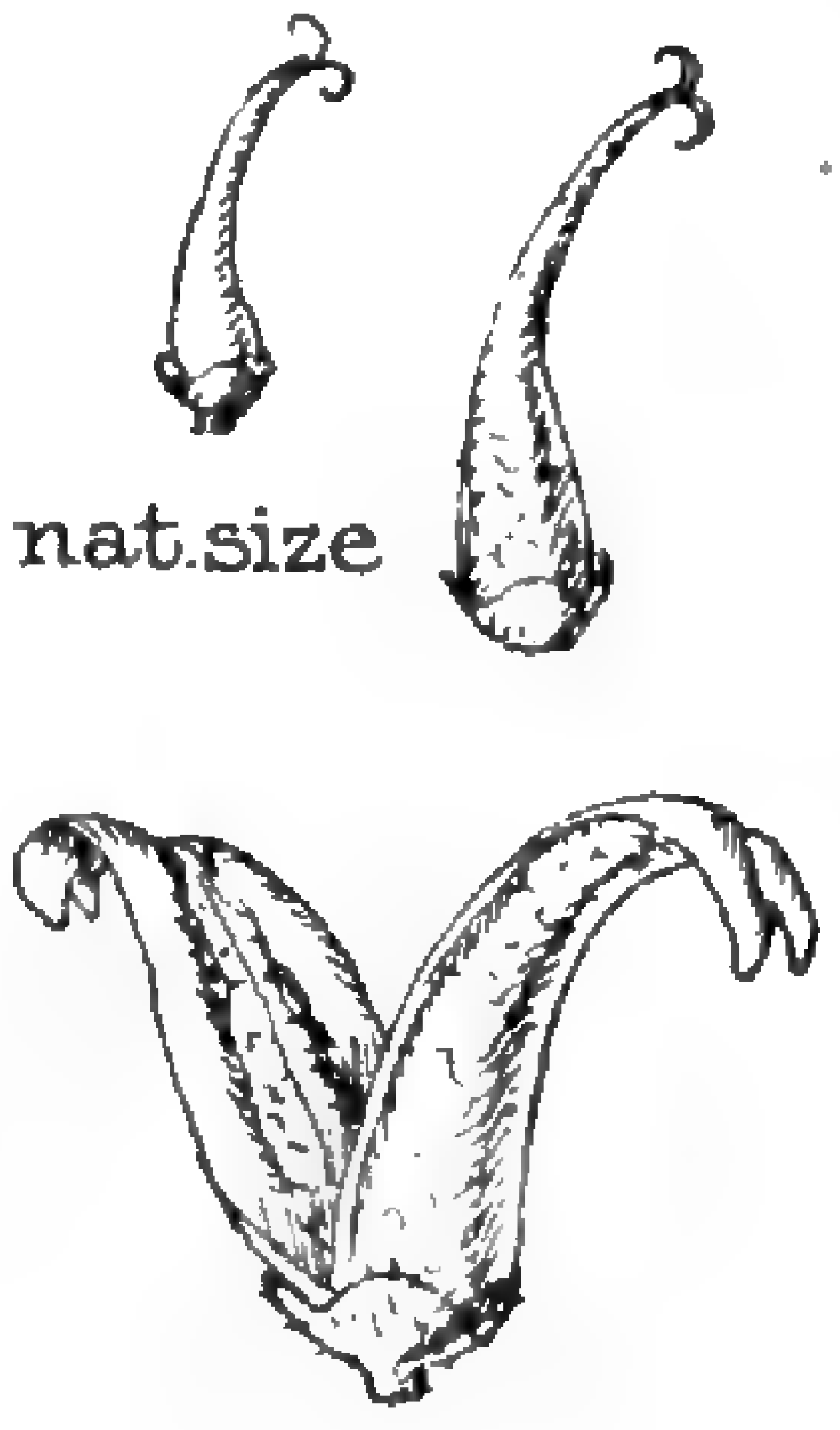
By H. H. HAINES, F.L.S.

[Read 7th June, 1906.]

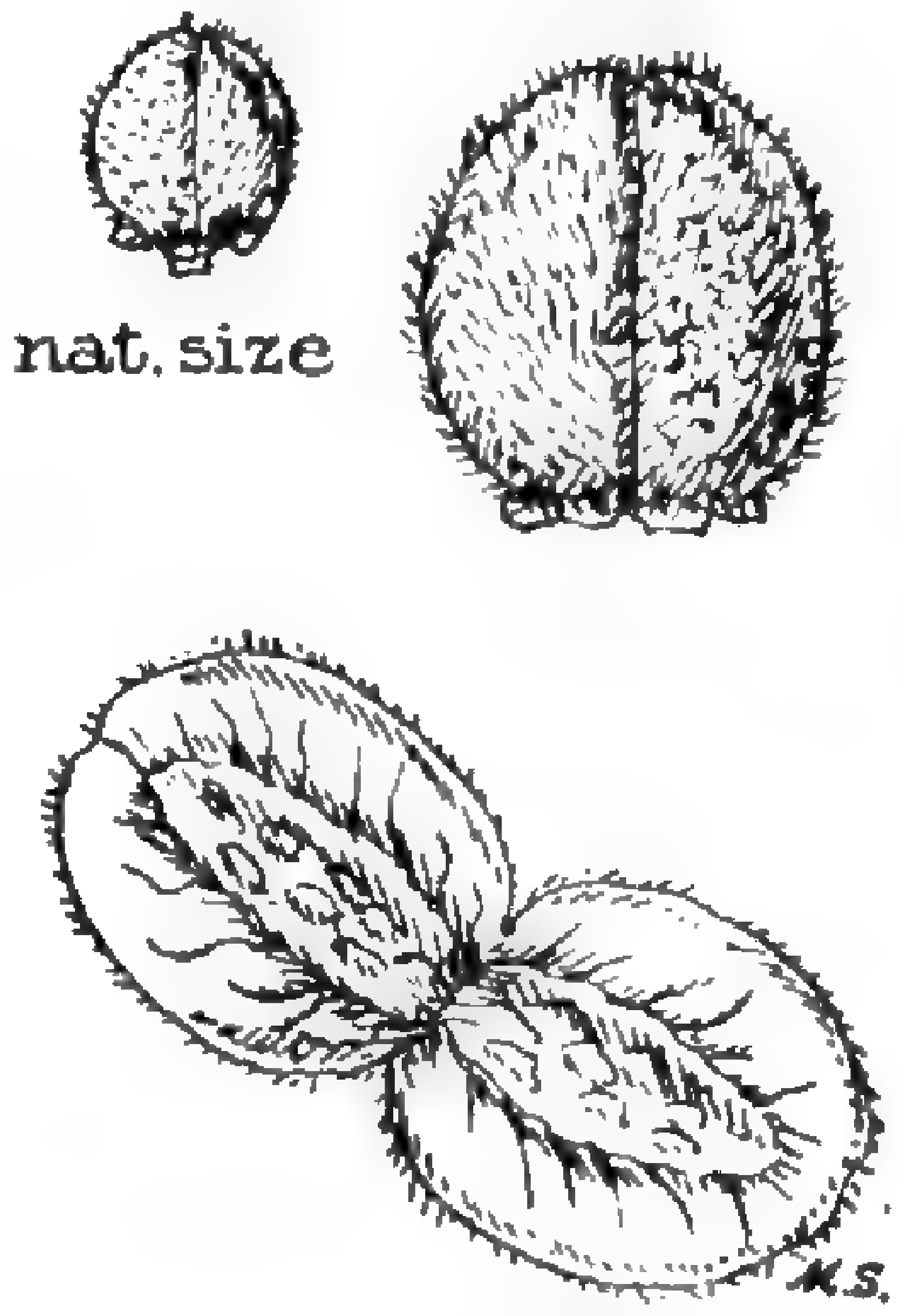
THE three species of *Populus* here dealt with are:—



P. ciliata, Hook. f.



P. Gamblei, nobis.



P. glauca, Haines.

1. POPULUS CILIATA, *Royle, Illustr.* (1839) p. 346, t. 84 *a*. figg. 1 et *h*, *i*, *k*, *l*, *m*; foliis ovato-lanceolatis, basi leviter cordatis aut truncatis; fructu ovoideo subgloboso, sæpe 3-carpellari, glabro; spicæ rhachide glabrâ.—*DC. Prodr.* xvi. pars 2, p. 329; *Brandis, Forest Fl.* p. 475; *Hook. f. Fl. Brit. Ind.* v. p. 638 (syn. *P. rotundifolia*, Griff. excl.); *Wallich, List*, n. 2796. *Cf.* fig. nostram, *suprà.*

P. pyriformis, Royle, Illustr. p. 344 *nomen.*

BHOTAN; *Griffith*, nn. 957, 2559. Lachen; alt. 6000–9000 feet, *Hook. f.*—Frequent in the Western Himalaya.

2. POPULUS GAMBLEI, *nobis* (an *Dode*?); foliis ovato-lanceolatis, basi leviter cordatis vel truncatis vel subtrapezoideis; fructu e basi ellipsoideâ oblongo-lineari, 2-carpellari, glabro, valvis maturatis recurvatis. *Cf.* fig. nostram, *suprà.*

KALIMPOONG; *Gamble*, nn. 2646 A, 7607; alt. 3500 feet, *Haines*, nn. 997, 997 *a*.

Of *P. Gamblei*, Dode, in Mém. Soc. d'Hist. Nat. d'Autun [Monog. *Populus*, 63, n. 103], the description is so imperfect that it is extremely doubtful whether it refers to *P. Gamblei*, nobis.—Mr. Gamble, Indian Timbers (1902), p. 690, says:—

"There is a Darjeeling species found in woods about Kalimpoong and Dumsong; apparently included in *P. ciliata*, Wall. in Hook. f. Fl. Brit. Ind. It is probably a distinct species, and is easily recognized by the leaves being square instead of cordate at the insertion of the petiole." Mr. Gamble is quite right as to this being a distinct species, but my photographs and specimens show that it cannot be recognized by the character of the leaves given.

3. Populus glauca, *Haines*, sp. nova; foliis ovatis acutis, basi leviter cordatis aut truncatis aut in petiolum breviter decurrentibus; fructu subgloboso, sæpe 2-carpellari, piloso; spicæ rhachide pilosâ. *Cf.* fig. nostram, p. 407.

Tonglo; alt. 7500–10,000 feet, *Haines*, n. 826.

This species is closely allied to *P. lanuginosa*, Oliver; Hook. Ic. Pl. (1900) t. 1943, *cf.* Hemsl. in Journ. Linn. Soc., Bot. xxvi. (1899) p. 536. This Yunnan species has ovoid-oblong white-woolly fruits and leaves deeply cordate at base.

[Not further referred to in this paper is *P. rotundifolia*, Griff. Private Journ. (1847) p. 290; Notulæ, iv. p. 382; Ic. Pl. Asiat. Rar. t. 546 (= *Liquidambar* sp., Griff. Itin. Notes (1848) p. 172).—This is the older name for *P. microcarpa*, Hook. f. Fl. Brit. Ind. v. p. 639, which gives, as the one locality for *P. microcarpa*, "about Panga and towards Chupcha, alt. 7600 feet, Griff.," which is the locality where Griffith obtained his *P. rotundifolia*.]

The principal point of interest concerning *P. Gamblei* to which I now wish to draw attention is the dimorphism of the leaves and shoots, which is possibly due to fungus agency. The normal leaves are quite glabrous; they attain only 6 by 4 in., have a straight or obtuse base and a slender petiole. In October 1904, I collected leaves of a Poplar which were very pubescent or even villous beneath. The smallest were about 6 in. long, and many attained 13 by 10 in.; the base was cordate, the petiole thick and comparatively short. There were, moreover, two large glands developed at the base of the leaf just above the petiole. No two species of the genus could, in fact, appear more distinct than this tree did and the normal form first described. There were, however, trees not far off with some branches bearing one form of leaf and others the other form; and I have since repeatedly discovered gradations between them. It will be seen that the cordate base of the second form nullifies the only character given in Gamble's 'Manual' for discriminating between this species and *P. ciliata*, Royle. *P. Gamblei* grows at an elevation of 1000–4000 feet. The photographs and examples exhibited show the two forms of leaves and the female inflorescence.

The most interesting characters of *P. glauca* are the frequency of 2-sexual characters and the large development of the perianth. The Poplars are usually described as diœcious without any qualification, while Pax, in Engler u. Prantl, 'Die natürl. Pflanzenfamilien,' remarks that the separation of the sexes is complete. Sargent, 'Silva Americana,' ix. p. 151, states that "individual trees bearing staminate and pistillate amenta, and also amenta with staminate and pistillate flowers mixed together, occasionally occur in the United States." But I know of no record of 2-sexual flowers.

I first observed a tree of *Populus glauca* in June, in ripe fruit. I visited this tree again on 20 April, the following year, in full flower; the flowers were all 2-sexual and $\frac{1}{4}$ in. in diameter; the so-called disc is expanded into an unequally 5–7-fid membrane with segments $\frac{1}{8}$–$\frac{1}{6}$ in. long. There were 6–12 stamens inserted at the base of this perianth on its very short tube; these are practically hypogynous. At the same date (20 April) I examined trees of *Populus glauca*, distant about 10 miles from the first-discovered tree, scattered for two miles along a ridge. I examined 13 trees. Of these, 4 were entirely female; the others were entirely 2-sexual, or with both 2-sexual and female flowers. There was not a single male tree. This scarcity of male trees has also been observed in the case of *Populus ciliata*, Royl Very many of the 2-sexual flowers on these trees had only 1, 2, 3, or 4 stamens. The flowers appeared protogynous.

I am greatly indebted to Dr. Stapf and Sir D. Brandis for having kindly undertaken for me the arduous task of ascertaining whether the name of "*glauca*" proposed by me for this species was preoccupied or not, and for the above reference to the 'Silva Americana.'

The localities mentioned are all in Sikkim and Darjeeling District, or adjacent thereto.

On the Conifers of China. By MAXWELL T. MASTERS, M.D., F.R.S., F.L.S., Corresponding Member of the Institute of France, Académie des Sciences.

[Read 7th June, 1906.]

IN the present communication I have endeavoured to do for China what I have previously attempted in the case of Japan (see Masters, "On the Conifers of Japan," in Journ. Linn. Soc., Bot. xviii. (1880) p. 473).

In the Journal of the Linnean Society, Bot. vol. xxvi. (1902) pp. 540 *et seq.*, I have also contributed to the Enumeration of Chinese Plants by Forbes & Hemsley a list with references and synonyms of all the Conifers then known to be natives of the Chinese Empire. That list, although prepared several years previously, was not published till October 1902. Since that time Dr. Henry and Mr. E. H. Wilson have enriched our collections with numerous examples. Mr. Wilson travelled in Central and in Western China, on behalf of Messrs. James Veitch & Sons of Chelsea, and not only collected largely but succeeded in introducing numerous species to the nurseries of his employers. The species collected in his first journey were enumerated in the 'Journal of Botany,' vol. xli. (1903) p. 267. His second journey from Ichang along the Yang-tse-kiang to the extreme West of China and northward to the Tibetan frontier, a little south of lat. 33° and in long. 104°, was still more prolific in novelties. Some account of his travels is given in the 'Gardeners' Chronicle' for 1905–6, in which Journal also some of the plants known to be in cultivation have been figured and described. In the present communication it is intended to present a list of the Conifers collected by Mr. Wilson on both of his journeys, and to give descriptions of those forms hitherto undescribed. Reference is in all cases made to the several species enumerated in the Journ. Linn. Soc., Bot. xxvi. (1902) before alluded to, and to those mentioned in the 'Journal of Botany,' vol. xli. (1903). The Catalogue now given is as complete as circumstances permit; it is, however, not necessary to repeat the details previously published concerning certain species either in the Index or in the paper on the Conifers of Japan. The names of the species recorded by Hayata from Formosa, by Matsumura [*], and by Henry [†] are included. I have also availed myself of Dr. Heinrich Mayr's recently published work on the forest-trees suitable for growth in Europe [‡]. Dr. Mayr's observations in the forests of North China, Japan, and the United States confer great weight on his opinions as to the identification and limitations of species.

I am under great obligations to Messrs. Veitch for placing at my disposal a complete set of specimens collected by Wilson, and to the collector himself for information concerning several of the species. I have also to thank Dr. Henry, Sir Dietrich Brandis, Sir George Watt, Mr. Duthie, and Mr. C. B. Clarke for valuable suggestions and information concerning the Himalayan Conifers, some of which are nearly related to those of Western China. Those gentlemen, however, must not be considered responsible for any opinions expressed in the course of this communication. A comparison of the present list with that published in my monograph of the Conifers of Japan, already alluded to, presents several features of interest. Reference may be made to that paper for notes on the distribution of species &c. which it is not necessary to repeat on this occasion. Some of the trees are closely allied or identical with Eastern Himalayan forms, whilst others present similar relationships to Japanese species. A large number of species are endemic, and the proportion of "new species" is large, especially in the genus *Picea*. It is not improbable that subsequent researches in the field may result in the discovery of intermediate forms; but the opinions now recorded have been arrived at after examination of existing material, repeated comparison of allied species, and consultation with Dr. Henry and other botanists familiar with the vegetation of China and adjacent countries.

Libocedrus macrolepis, *Benth.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 540; *Mayr, Fremdländ. Wald- und Park-Baüme*, p. 316.

YUNNAN (*Henry* 11566!); SZEMAO, cult. (*Wilson* 76!).
FORMOSA.

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[*] Matsumura on the Distribution of Formosan Conifers, Tōkyō Botanical Society, 22 April, 1905.

[†] Henry, Trans. Asiat. Soc. Japan, vol. xxv. Suppl. p. 90.

[‡] Mayr, 'Fremdländische Wald- und Park-Baüme,' 1906.

The distribution of the species of *Libocedrus* is peculiar, since they are found in New Zealand, the Chilian Andes, North-Western America, and Southern China. Zeiller, 'Éléments de Paléobotanique' (1900), mentions the genus as occurring in the middle and upper Cretaceous beds as well as in the Tertiary strata. See also Renault, 'Cours de Botanique Fossile' (1885), p. 136.

Thuya (§ **Biota**) **orientalis**, *Linn.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 540; *Mayr, l. c.* p. 203.
(*Wilson* 3011 !).
FORMOSA (*Hayata*).

T. sutchuanensis, *Franch. in Journ. de Bot.* (1899) p. 262.
Mountains of SZECHUAN, alt. 1400 met. (*Père Farges* !).

M. Franchet regards this as distinct. In the Journ. Linn. Soc., Bot. xxvi. (1902) p. 540, I have pointed out the close resemblance to *T. plicata* of Donn, the N.W. American species often called *T. gigantea*. It is also very close to the Japanese species *T. japonica*.

Cupressus (§ **Chamæcyparis**) **formosensis**, *Matsumura, in Bot. Mag. Tōkyō* (1901), p. 137.
FORMOSA, in monte Morrison (*Honda*).

C. funebris, *Endl.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 540.
(*Wilson* 3012 !). WEST HUPEH (*Wilson* 335 !).

C. sempervirens, *Linn.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 541.

Juniperus chinensis, *Linn.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 541; *Mayr, l. c.* p. 291.
WEST HUPEH (*Wilson* 1701 ! 2113 ! 3010 ! 3013 !).
FORMOSA (*Hayata*). JAPAN. TEMPERATE HIMALAYA.

J. communis, *Linn.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 542.

Var. **nana**, *l. c.*

J. litoralis, *Maxim.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 542.

Juniperus recurva, var. **squamata**, *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 543.
West Hupeh (*Wilson* 2113 !).

J. rigida, *Sieb. & Zucc.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 543; *Mayr, l. c.* p. 291.
West Hupeh (*Wilson* 370 !).
Formosa (teste *Hayata*). Japan.

J. sphærica, *Lindl.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 543.

J. taxifolia, *Hook. et Arn.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 543.
Szechuan (*Wilson* 428 !). West Hupeh (*Wilson* 479 !).
Formosa (teste *Hayata*). Luchu, &c.

Cryptomeria japonica, *D. Don*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 544, et xviii. (1881) p. 497; *Mayr, l. c.* p. 278.
(*Wilson* 3608 !, cult.).
Formosa, ? cult. (*Hayata*). Japan.

Glyptostrobus heterophyllus, *Endl.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 544; *Mayr, l. c.* p. 289.

Cephalotaxus drupacea, *Sieb. & Zucc.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 544; *Mayr, l. c.* p. 269.
West Hupeh (*Wilson* 100^a !).
Formosa (teste *Hayata*). Japan.

C. Fortunei, *Hook.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 545; *Mayr, l. c.* p. 269.
West Hupeh (*Wilson* 100 !).

Var. **concolor**, *Franch.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 545.

C. Mannii, *Hook. f.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 545.

C. Oliveri, *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 545 *Gard. Chron.* April 11, 1903, p. 227, fig. 93.
West Hupeh (*Wilson* 72 !).

Cephalotaxus pedunculata, *Sieb. et Zucc.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 545.

C. Griffithii, *Hook. f.*; *Mast. in Journ. of Botany, l. c.* p. 269.
WEST HUPEH (*Wilson* 714! 2114^a!).

Taxus baccata, *Linn.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 546.
WEST HUPEH (*Wilson* 479! 624!), forsan ad *T. cuspidatam* rectius referenda.

Torreya grandis, *Fortune*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 546.

T. nucifera, *Sieb. et Zucc.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 546.
(*Wilson* 624^a!). JAPAN.

Ginkgo biloba, *Linn.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 546; *Mayr, l. c.* p. 288.
YUNNAN. JAPAN.

Podocarpus argotænia, *Hance*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 547.
CHINA OCCID. (*Wilson* 1894!), in planitie prope montem Omei (*Wilson* 3005!).
FORMOSA (teste *Hayata*).

P. macrophylla, *Wall. Cat.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 548; *Mayr, l. c.* p. 391.
MT. OMEI (*Wilson* 3007!).
FORMOSA (fide *Hayata*). *P. neriifoliæ* affinis nisi eadem?

P. chinensis, *Wall. Cat.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 547.

P. latifolia, *Wall. Cat.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 547.
FORMOSA.

P. neriifolia, *D. Don*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 548.

P. sutchuanensis, *Franch.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 548.

Podocarpus Nageia, *R. Br.—Syn.* P. Nagi, *Mayr, Fremdl. Wald- u. Park-B.* p. 391.
FORMOSA (teste *Hayata*).

Dacrydium Beccarii, *Parl.*? ; *Hance, in Journ. Botany*, 1883, p. 357.
HAINAN (*B. C. Henry*).

Cunninghamia sinensis, *R. Br.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 548; *Mayr, l. c.* p. 285.
FORMOSA; LIU KIU (teste *Matsumura*).

Pinus parviflora, *Sieb. et Zucc.*; *Mast. in Journ. Linn. Soc., Bot.* xxxv. (1904) p. 578, et xviii. (1881) p. 504.
FORMOSA (*Hayata*). JAPAN.

P. (§ **Strobus**) **scipioniformis**, *Mast. in Bull. Herb. Boissier*, vi. (1898) p. 270, *et in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 552.
HUPEH (*Henry*!).

P. koraiensis, *Sieb. et Zucc. Fl. Jap.* ii. p. 28, t. 116; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 550, et xxxv. (1904) p. 582; *Mayr, l. c.* p. 386.
WESTERN CHINA, tree 30 ft., in forests (*E. H. Wilson* 597! 3017!). WEST HUPEH (*Wilson* 662!). FORMOSA (*Hayata*).
COREA, JAPAN, KAMTSCHATKA.

P. yunnanensis, *Franch. in Journ. de Bot.* 1899, p. 253; *Mast. in Gard. Chron.* Sept. 23, 1905, p. 226, fig. 86.
YUNNAN (*Delavay* in herb. Paris!).
SZECHUAN and E. TIBET, Tung Valley, local (*Wilson* 3000!). The drawing of Wilson's specimens was obligingly compared for me with Franchet's type specimen in Paris and pronounced to be "*identique*." It is allied to *P. Khasya* and to a species collected in Manipur by Sir George Watt. The differences are pointed out in the article in the 'Gardeners' Chronicle' above cited.

P. Armandi, *Franch.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 549, et xxxv. (1904) p. 582.
HUPEH (*Wilson* 577! 662! 829!).

P. Bungeana, *Zucc.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 549, et xxxv. (1904) p. 590; *Mayr, l. c.* p. 372.
(*Wilson*, sine pittacio.) CHINA BOR. SHENSI; HUPEH.

Pinus Massoniana, *Lamb.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 551, et xxxv. (1904) p. 611.

P. sinensis, *Lamb.*; *Mayr, Fremdl. Wald- u. Park-B.* p. 349.

CHINA BOR., in mont. Wutai, *Mayr.* For numerous other localities see Journ. Linn. Soc. *l. c.* p. 551.

FORMOSA.

P. Henryi, *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 550, et xxxv. (1904) p. 618; *Mayr, l. c.* p. 357.

In the note relating to this species above cited, I inadvertently stated that in *P. densiflora* the resin-canals are in the substance of the mesophyll; but this is only occasionally the case, the usual position is subepidermal. The cone-scale of *P. Henryi* is distinguishable by its deeply depressed umbo.

P. densiflora, *Sieb. et Zucc.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 549, et xviii. (1881) p. 503, et xxxv. (1904) p. 619; *Mayr, l. c.* p. 343.

WEST SZECHUAN. "Forests of the Min Valley at an altitude of 7000–8500 ft. Tree 30–60 ft. high, 6–10 ft. in girth. Timber hard and valued for building purposes. The Min Valley, where this species and *P. yunnanensis* occur, enjoys a peculiarly warm dry climate."—*Wilson* in litt. (*Wilson* n. 3001!)

JAPAN. KOREA.

Mayr, *l. c.*, doubts the occurrence of this species in China, but at the time of writing he had not seen the specimens collected by Wilson.

P. densata, *Mast.*, sp. nov. *Arbor* 40–100-ped. (*Wilson*). *Rami* vetustiores fusci glabri, pulvinis parum prominentibus late oblongo-obovatis, medio incrassatis obsiti. *Ramuli* novelli glabri fusco-aurantiaci, pulvinis prominentibus. *Perulæ* subcoriaceæ castaneæ oblongo-lanceolatæ ad margines tenuiores albido-filiferæ. *Vaginæ* 10–15 mill. long., squamis membranaceis albidis laceratis arcte convolutis sursum increscentibus constantes. *Folia* bina vel terna, 6–12 cent. longa, linearia semiteretia vel subangulata ad margines serrulata, ad apicem acutata. *Canales resiniferi* plurimi sub epidermide positi, meristela elliptica vel subtriangularis, fasciculus divisus cellulis lignescentibus firmatus. *Strobili* gemini laterales subsessiles patentes seu recurvati circa 5 cent. long., 4 cent. lat., ovoideo-conici. Squamæ lignosæ fuscæ. Apophysis incrassatus pulviniformis superne

transverse oblongus demum reflexus; umbo rhomboideus parum depressus deltoideo-mucronatus; mucrone caduco.

CHINA OCCID., in silvis prope vallem Ya Lung ad alt. 9000–11,000 ped. (*Wilson* 3015 !).

A species, according to Mr. Wilson, resembling the Scots Pine in general aspect and growing in forests at a higher altitude than any other Pine met with by him. The wood is used for making torches. It bears a close resemblance to *P. densiflora*, but differs especially in the thickened cushion-like apophyses. The resin-canals are mostly subepidermal, but, as in *P. densiflora*, some are occasionally found in the substance of the leaf, especially near the corners.

Pinus prominens, *Mast.*, sp. n. *Arbor* 25-ped.; *ramis* fuscis glabrescentibus, pulvinis late oblongo-obovatis dorso medio incrassatis. *Novelli* glabri aurantiaci, pulvinis parum prominentibus superne ad marginem eversis. *Gemmæ* ovoideæ in mucronem fastigatæ. *Perulæ* subcoriaceæ, ferrugineæ, lanceolatæ acutatæ ad margines albidas lacerato-membranaceæ. *Vaginæ* ad 2 cent. long., squamis arcte convolutis membranaceis transverse sulcatis sursum increscentibus. *Folia* bina linearia 10–14 cent. dorso convexa, facie antica concava, apice cartilagineo-mucronata, marginibus obsolete serrulatis. *Canales resiniferi* numerosi subepidermide positi; meristela elliptica, fasciculus vasorum bifurcatus. *Amenta mascula* ——. *Strobili* sessiles patentes 4–5 cent. long., 3 cent. lat., oblongi, basi apiceque angustati, maturitate squamis expansis ovoideo-subglobosi. Squamæ lignosæ. Apophysis clavato-dilatatus, umbo prominens deflexo-assurgens rhomboideus apice subulato mucronatus.

CHINA OCC. versus Tu-chu-lu (*Wilson* 3016 !).

Allied to *P. densiflora* and to *P. densata*, but distinguishable by its buds, its cones and prominent umbos.

P. Thunbergii, *Parl.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 552, et xxxv. (1904) p. 629; *Mayr, Fremdl. Wald- u. Park-B.* p. 350.

P. luchuensis, *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 551; *Mayr, l. c.* p. 344.

INS. LIU KIU, teste Matsumura; species a me haud visa.

Pinus mandshurica, *Ruprecht*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 551.

YUNNAN (*Henry* 9868 !).

JAPAN.

Picea purpurea, *Mast.*, sp. n. *Arbor* 60-ped.; *ramis* vetulis griseis pulvinis parum prominentibus apice æqualibus patulis, ramulis novellis aurantiacis dense setosis, cicatrices subellipticæ parum angulatæ. *Gemmæ* late ovoideæ, squamis late oblongis subcoriaceis ferrugineis ad margines altius coloratis obtectæ. *Folia* 10–12 mill. long., linearia acuta curvata, complanata, facie superiore sulcata glaucescentia, subtus nervo medio prominente carinata, utrinque stomatifera. *Strobili* immaturi 5–6 cent., purpurascentes, oblongo-cylindrati acutati. *Bracteæ* haud visæ. *Squamæ* subcoriaceæ late oblongæ, superne productæ ad margines undulatæ sæpe eversæ. *Seminis* ala membranacea erecta asciiformis.

CHINA occ., in silvis ad Sung Pan prope Tibetam, alt. 9500–11,000 ped. (*Wilson* 3026 !).

A very remarkable species belonging to the flat-leaved series, distinguishable by the characters of the bark, foliage, and cones.

P. ajanensis, *Fisch.*; *Mast. in Journ. Linn. Soc., Bot.* xviii. (1881) p. 508, et xxvi. (1901) p. 553; *Mayr, l. c.* p. 321.

HUPEH; SZECHUAN; WUSHAN.

JAPAN; MONGOLIA.

P. Alcockiana, *Carr.*; *Mast. in Journ. Linn. Soc., Bot.* xviii. (1881) p. 508, et xxvi. (1902) p. 553.

WEST SZECHUAN, Ta-chien-lu, alt. 10,000–14,000 ped. (*Wilson* 3028 !). An species distincta?

MONGOLIA; JAPAN.

P. brachytila, *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 553.

Abies brachytila, *Franch.*

SZECHUAN; YUNNAN.

P. likiangensis, *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 554.

Abies likiangensis, *Franch.*

YUNNAN.

Picea Maximowiczii, *Regel*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 554, et xviii. (1881) p. 507.

HUPEH? JAPAN.

P. obovata, *Ledeb.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 554, et xviii. (1881) p. 506.

Var. **Schrenkiana**, *Mast. l. c.*

Subvar. **Loczyi**, *Kanitz*; *Mast. l. c.*

CHIHLI.

P. Glehni, *F. Schmidt*; *Mayr, Mon. Abiet. Japon.* p. 56, t. 4. f. 11; *Mast. in Gard. Chron.* March 6, 1880, p. 300, c. ic.

FORMOSA (*Hayata*), SACHALIN, MANCHURIA.

P. Watsoniana, *Mast.*, sp. n. *Arbor* 40-ped. *Rami* vetustiores cortice gilvo seu fulvido in laminas tenues decidentes obtecti. *Ramuli* glabri, pulvinis prominentibus muniti. *Pulvini* oblongo-obovati superne erecti in petiolum brevem ascendentem angustati, cicatrix quadrangularis. *Gemmæ* ovoideo-conicæ, perulis subcoriaceis ovatis acutis, ad margines tenuiores altius coloratis vestitæ. *Folia* 10–12 mill. long., linearia, curvata, quadrangularia, ad apices acutas cartilaginea, utrinque stomatifera. *Strobili* 5–6 cent. long., deflexi oblongi. *Bracteæ* late ovatæ acutæ parvæ. *Squamæ* subcoriaceæ pallide fuscæ glabræ, 13–14 mill. long., spatulatæ margine superne suborbiculatæ appressæ integræ vel parum irregulariterque dentatæ. *Semina* ala membranacea pallida asciiformi munita.

CHINA OCCID., prope fines Tibetæ ad Sung Pan, alt. 6500 ped. (*Wilson* 3023 !).

At the request of Mr. Wilson, I have affixed to this species the name of Mr. C. Haines Watson, of the Chinese Maritime Customs Service. Mr. Watson accompanied Mr. Wilson in his first journey to Sung Pan. The prolongation of the pulvinus into a short erect petiole is very marked in this species.

P. asperata, *Mast.*, sp. n. *Arbor* ramis vestustioribus crebris aurantiacis, pulvinis oblongis setaceis apice angustatis foras deflexis, cicatrices quadrangulares. *Gemmæ* conicæ, perulis pallide ferrugineis, deltoideo-lanceolatis, resiniferis vestitæ. *Folia* 12–15 mill. long., linearia curvata, quadrangulares interangulos prominentes stomatifera dorso ad apicem fastigata. *Strobili* 8–9 cent. long., 12–14 mill. lat., cylindrato-oblongi. *Bracteæ* oblongo-spatulatæ apiculatæ squamis multo breviores.

Squamæ appressæ subcoriaceæ pallidæ fuscæ basi angustatæ, apice rotundatæ subintegræ. *Seminis* ala erecta membranacea, pallide ferruginea, oblonga obtusa, squamâ parum brevior.

CHINA OCCIDENT., prope Tibetam in silvis prope Sung Pan, alt. 6000–11,000 ped. (*Wilson* 3025 !).

Similar to *P. Watsoniana*, which grows in the same district but at a lower elevation. It differs in the bark, in the pulvini (which in this species are setose and less distinctly petioled), in the more lanceolate bud-scales, in the leaves, in the larger cones, and in other details. Possibly the examination of a larger series of specimens would show intermediate conditions, proving that these characteristics are not to be absolutely depended on as points of distinction.

Picea aurantiaca, *Mast.*, sp. n. *Arbor* 15–40-ped.; ramis vetulis glabris aurantiacis; pulvini glabri nitentes, lineari-oblongi, superne vix constricti exerti patuli, cicatrices subquadrangulares. *Perulæ* late ovatæ membranaceæ ferrugineæ. *Folia* ad 15 mill. linearia curvata quadrangulata inter angulos prominentes stomatifera ad apicem cartilagineo-mucronata. *Strobili* immaturi penduli 5–6 cent. long., oblongi, purpurascentes. *Bracteæ* ? *Squamæ* subcoriaceæ appressæ violaceæ, parte superiore rotundatæ violaceæ.

CHINA OCCIDENT., prov. SZECHUAN in silvis ad alt. 12,000 ped. (*Wilson* 3029 !)

A species remarkable for the deep orange-coloured bark and the linear pulvini, scarcely, if at all, dilated at the apex.

P. retroflexa, *Mast.*, sp. n. *Arbor* ramis fusco-aurantiacis glabrescentibus, pulvini oblongi, superne dilatati patenti-reflexi, cicatrix quadrangularis. *Folia* ——. *Strobili* 10–12 cent. long., cylindrato-oblongi. *Bracteæ* ——. *Squamæ* coriaceæ fuscæ apice rotundatæ imprimis appressæ demum arcte reflexæ.

WEST SZECHUAN, ubi vulgaris prope Ta-chien-lu (*Wilson* 3030 A!).

Very remarkable in its sharply decurved cone-scales. It is possible that the recurved condition of the cone-scales may prove to be exceptional, as a similar condition has been observed as a malformation in the common Spruce. The scales are in some cases covered with a fungus which Mr. Massee identifies as *Pleosporopsis strobilorum,* a cosmopolitan species, attacking the cone-scales of Conifers; see Greville, Scot. Crypt. Flor. p. 275.

Picea Mastersii, *Mayr, Fremdländische Wald- und Park-Baüme* (1906), p. 328, figs. 105–107.
CHINA BOREAL., Wutaishan (*Mayr* !).

P. Neoveitchii, *Mast. in Gard. Chron.* Feb. 21, 1903, p. 116, figs. 50, 51, *et in Journ. of Botany*, August 1903, p. 267.
HUPEH (*Wilson* !), alt. 5500 ped.

P. Wilsoni, *Mast. in Gard. Chron.* Feb. 28, 1903, p. 133, figs. 55, 56; *Mayr, l. c.* p. 339.
HUPEH, Fang (*Wilson* 1897 !).

Keteleeria Davidiana, *Beissner*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 554, *et in Gard. Chron.* 1903, p. 84, fig. 38.
Abies Davidiana, *Franchet*; *Mast. in Gard. Chron.* April 9, 1887.
CHINA OCCID., "Tung Valley" (*Wilson* 3018 !); HUPEH (*Wilson* 426, 430 !), Nan'to (*Henry* 11358 !); SZECHUAN (*Henry* 7099 !); YUNNAN (*Henry* 12734 ! 12855 !).

K. Fabri, *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 555.

K. sp.? *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 556.

K. Evelyniana, *Mast. in Gard. Chron.* March 28, 1903, fig. 82.
YUNNAN, Yuanchiang, alt. 4000 ft. (*Henry* !).
A tree described by Dr. Henry as very rare, and very handsome from the colour of the foliage.

Tsuga Brunoniana, *Carr.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi (1902) p. 556.

T. chinensis, *Mast. l. c.* p. 556.
Abies chinensis, *Franchet.*

T. Sieboldi, *Carr.*; *Mast. in Journ. Linn Soc., Bot.* xxvi. (1902) p. 556; *Mayr, l. c.* p. 429.
WEST HUPEH (*Wilson* 372, 1898 !).

T. yunnanensis, *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 556, *et in Gard. Chron.* April 14, 1906, p. 236, fig. 93.
Abies yunnanensis, *Franch.*
YUNNAN (*Wilson* 3014 !); SZECHUAN (*Henry* 7156 !), alt. 6000–8000 ped., 8896 ! Mt. Omei (*Pratt* 871, 987), Ta-chien-lu, 9000–13,000 ped. (*Wilson* 1898 !); WEST HUPEH (*Wilson* 572 !).
The native name is "Thie sha," or iron-wood.

Tsuga diversifolia, *Mast. in Journ. Linn. Soc., Bot.* xviii. (1881) p. 514; *Mayr, l. c.* p. 425.

Abies diversifolia, *Maxim. in Bull. Acad. Pétersb.* xii. (1868) p. 229 (*Mél. Biol.* vi. p. 373).

FORMOSA (fide *Hayata*). JAPAN, Kiousiou (*Maximowicz*).

Easily recognizable by its relatively short leaves of unequal lengths.

Abies Delavayi, *Franch.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 557, *et in Gard. Chron.* April 7, 1906, fig. 82.

MT. OMEI (*Faber*!); WA SHAN (*Wilson* 3022 A!).

A. Fargesii, *Franch.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 557, *et in Gard. Chron.* April 7, 1906, fig. 83.

The commonest Silver Fir in Central China (*Wilson* 3022!), alt. 6000–11,000 ft.

Var. **sutchuanensis**, *Franch.*; *Mast. l. c.* p. 557.

A. firma, *Sieb. et Zucc.*; *Mast. in Journ. Linn. Soc., Bot.* xviii. (1881) p. 514, et xxvi. (1902) p. 557; *Mayr, Fremdl. Wald- u. Park-B.* p. 245.

WEST SZECHUAN (*Wilson* 3020!).

JAPAN; MANCHURIA.

Mr. Wilson speaks of this tree as being "rare, but occasionally met with in the wild mountainous country between Ya Chou and Tatien-lu at an altitude of 7500–8500 ft. The specimens were gathered from a tree measuring 100–150 ft. in height, 20–25 ft. in girth. The timber is said to be of little value." Mr. Wilson, judging from the locality in which it was found, thought it might be an undescribed species, but the resemblance to the Japanese *A. firma* is so great that I hesitate to separate it as specifically distinct. The species occurs not only in Japan, but in the Chinese provinces of Shensi, Yunnan, as well as in Manchuria.

A. Veitchii, *Lindl.*; *Mast. in Journ. Linn. Soc., Bot.* xviii. (1881) p. 515, et xxvi. (1902) p. 557; *Mayr, l. c.* p. 258.

A. Mariesii, *Mast. in Gard. Chron.* 1879, p. 788, c. ic., *et in Journ. Linn. Soc., Bot.* xviii. (1881) p. 519.

FORMOSA (teste *Hayata*).

Northern Japan.

Abies sachalinensis, *Masters, in Gard. Chron.* n. s. xii. (1879) p. 588, c. ic., *et in Journ. Linn. Soc., Bot.* xviii. (1881) p. 517.

FORMOSA in monte Morrison (*Honda*).

JAPAN, SACHALIN.

A. recurvata, *Mast.*, sp. n. Arbor 50–80-ped., cortice rubro-fusco. *Rami* glabri pallide fulvidi, pulvinis oblongo-spatulatis rugulosis parum prominentibus obsiti, cicatrices orbiculares pulviniformes albidæ juventute rubro-marginatæ. *Gemmæ* subglobosæ pallide fulvidæ resiniferæ. *Folia* dense spiraliter disposita quaquaversa arcte deflexa assurgentes 10–12 mill. long., 2–3 mill. lat., lineari-liguliformes, curvata apice rotundata apiculata, facie superiore canaliculata glaucescentia, facie inferiore nervo medio prominente carinatæ utrinque stomatifera. *Canales resiniferi* duo dorsales sub epidermide prope extremos positi. Hypoderma crassum. *Strobili* aggregati breviter pedicellati 7–8 cent. long. (ut videtur), ovoideo-oblongi? *Bracteæ* squamis fere æquilongæ, spatulatæ, margine superiore denticulatæ ad apicem in processum deltoideum productæ. *Squamæ* subcoriaceæ transverse ellipticæ, 2 cent. lat., 1 cent. long., basi inter lobos rotundatos patulos cuneatim angustatæ.

CHINA OCC., "Min Valley" in silvis ad alt. 8000–9500 ped. (*Wilson* 3021 !).

This is a very remarkable species, unlike any other in its strongly decurved but assurgent leaves. Mr. Wilson speaks of it as a very local species, forming entire forests in the Min Valley one day's journey south of Sung-pan. The tree reaches a height of 50–80 ft. and has reddish-brown bark. "The leaves are deep green or very glaucous, varying very much in this respect. The specimens were gathered in September 1903, but the cones had already fallen to pieces and I was only able to gather half-cones. The cones are small, erect, brown, borne in clusters at the ends of the branches and near the tops of the trees. The timber is hard, resinous, and highly valued for building purposes. I failed to obtain any seeds, so that it is not in cultivation."—*Wilson* in litt.

A. squamata, *Mast. in Gard. Chron.* May 12, 1906, p. 299, fig. 121.

CHINA OCCIDENT., in silvis prope Tatien-lu (*Wilson* 3019 !).

A species remarkable for the orange-coloured bark, which peels off in large flakes in a similar manner to that observed in

the Plane tree. "It attains the highest altitude of any silver fir in the district" (*Wilson*).

Pseudolarix Fortunei, *Mayr*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 557; *Mayr, Fremdl. Wald- u. Park-B.* p. 392.
Laricopsis Fortunei, *Kent, in Veitch, Manual* (1900) p. 403.
CHEKIANG; KIANGSI.

Larix chinensis, *Beissner*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 558; *Mayr, l. c.* p. 299.
NORTH SHENSI (*Giraldi*).

L. davurica, *Turczaninow*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 558; *Mayr, l. c.* p. 299.
CHIHLI (*Hance*).

L. Griffithii, *Hook. f. et Thoms.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 558.
WEST SZECHUAN (*Pratt*). E. HIMALAYA.

L. Potaninii, *Batalin*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 558, *et in Gard. Chron.* March 24, 1906, fig. 68.

L. sibirica, *Ledeb.*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 558.

L. thibetica, *Franchet*; *Mast. in Journ. Linn. Soc., Bot.* xxvi. (1902) p. 559. Ad *L. Potaninii* forsan referenda?

L. Principis-Rupprechti, *Mayr, l. c.* p. 309, fig. 4.
CHINA BOR., Wutaishan (*Mayr*).
Species a me haud visa.

Pseudotsuga japonica (*B. Hayata*, paper read before the Tōkyō Botanical Society, 22 April, 1905), *Shirasawa*; *Mayr, l. c.* p. 406.
FORMOSA. MID-JAPAN.

Taiwania cryptomerioides, *Hayata*.

Since the foregoing notes were written, Mr. Hayata, of the Botanical Institute of Tōkyō, has laid before the Society a description, accompanied by an illustration, of a new genus of Conifers found in Formosa. The description is published in the Journal of the Society, the present volume, p. 330, pl. 16. The genus belongs apparently to the Taxodineæ.

A Contribution to the Botany of Southern Rhodesia.

By Miss L. S. Gibbs, F.L.S.

[Read 21st June, 1906.]

(Plates 17–20.)

Introduction.

This collection was made in two localities in Southern Rhodesia, during the months of August, September, and October—that is to say the latter part of the dry season, which corresponds to the end of winter and beginning of spring for that part of the African continent. In Rhodesia the seasons show a very marked alternation of wet and dry periods, the Summer or rainy season beginning in November and lasting until March, about five months; while the remaining seven months, corresponding to Autumn, Winter, and early Spring, constitute the dry season. The summer rains are not persistent, being chiefly in the form of heavy thunderstorms, and rarely lasting more than half a day; while during the long winter period rain is exceptional. The air is extraordinarily dry and the sun's rays very strong, few cloudy days occurring during my stay in the country. The temperature was generally over 80°, and as spring advanced rose to above 90°. Under these conditions, after such a long drought, the country presents an arid, not to say desert, appearance, that makes an indelible impression on anyone to whom this type of tropical vegetation is new.

The whole country is wooded, small trees with spreading crowns, spaced, with undershrubs between—a typical "Baumsteppe," or tree veld—affording pasturage for cattle. The Rhodesian tree veld continues on the West to Lake Ngami, possibly to Angola, on the south to Betchuanaland, parts of the Northern Transvaal (Houtbosch and Macalliesberg), Swaziland and Delagoa Bay, where many of the tree and veld types, common in Rhodesia, occur (**12**). In August the trees and bushes are quite bare with the exception of a few evergreens and some shrubs like *Croton gratissimus* and *Tarchonanthus camphoratus*, which retain their leaves but show such extreme drought condition as to appear quite lifeless. Yellow grass haulm generally about a metre high covers the ground. As September advances a few of the trees, like *Dombeya rotundifolia*, *Turræa Randii*, *Erythrina latissima*, and *Peucedanum fraxinifolium*, flower, but they are too scattered to have any effect on the general desolation. In October a greenish film, as in European woods, is apparent and a few trees, like *Pterocarpus angolensis* with its crown of orange-coloured blossom, *Afzelia cuanzensis* and *Securidaca longipedunculata*, come into flower and leaf.

Towards the end of October the natives systematically burn the veld to expose the young grass-shoots, on which the cattle can pasture. This means that all the standing dry grass over the whole country is burnt off, and with it the remains of last year's herbaceous plants, which, in that dry climate, do not decompose, but remain as in a natural herbarium, simply dried up exactly as they grew. All the seed which has not fallen, and most of that fallen, must consequently be burnt up, and the bark of trees and the lower branches of shrubs singed and maimed; also herbaceous plants, which have been rash enough to send up early shoots, receive a very prompt set-back. Through the combined action of fires and white ants there can be no accumulation of humus, and the upper surface of this sandy soil is, perhaps, so dried by the long drought that the fires can have no physiological effect on it; in fact, this surface layer of loose sand probably effectively prevents the evaporation of water held by the subsoil, by interrupting capillary action. The prevalent grasses occur in tufts, always showing the surface soil between. Water is here the predominant factor, for vegetation and roots go far to seek it. Therefore it is the subsoil which contains the vital elements, for these tropical latitudes, and not the upper layers, as with temperate surface-rooting trees.

The practice of burning the veld obtains all through South Africa, South Central Tropical and German West Africa, and possibly over the rest of the dry tropical region of the continent, and must have an enormous effect on the distribution and survival of certain species.

If we consider the other factors which prevail in this area, they all seem to make for the even distribution of a certain vegetative type: the summer rains, the long season of winter drought, and the extreme dryness of the atmosphere; even the physiological aspect of the country, with no great range of mountains, or large lake and river systems, which tend to segregate species; also the habits of the natives with their internecine wars, whole tribes being continually on the move, cultivating the ground as they move on, and continually seeking fresh fields and pastures new; and finally the great herds of game which wander at will through these limitless wastes. We therefore get everything to promote and apparently nothing to check a very wide distribution of the same species, and, as might be expected from the above considerations, the trend from west to east is very marked. Portuguese and German South-west Africa have been very well worked by certain collectors, and on that account the prevailing types have been labelled Angolan because collected there for the first time, and the same holds for British Central and German East Tropical Africa. Every fresh collection made in South Central Africa and Rhodesia on the east extends the southern limit of Tropical eastern species and the eastern range of what were considered Angolan types, also gives new localities for those plants which have been oftenest collected, therefore best known and consequently labelled general. Purely South African species, for the same reasons no doubt, are constantly increasing their northern tropical range.

In the present case new records of Angolan types occur:—*Gleditschia africana*, *Vitex flavescens*, and *Erlangea Schinzii*, at the Victoria Falls; *Lobelia fonticola* and *L. multidentata*, two of Baum's Kunene plants, occurred in the Matopos, with *Euphorbia benguellensis*. *Melasma sessiliflorum*, known from Angola and Mozambique, and *Dyschoriste Perrottetii* from Upper Guinea and Nileland, find a South Central record, and with *Æschynomene cristata* and *Olax dissitiflora*, supposed to be Eastern, were common at the Falls, whither also *Capparis tomentosa* extends its general distribution.

For the Matopos, as might be gathered from the geographical situation, the new records are more numerous and chiefly of southern types. *Sphedamnocarpus galphimiæfolius*, *Pharnacium Zeyheri*, and *Indigofera cryptantha* were only known from the Transvaal. *Loranthus Kraussianus*, *Plectranthus floribundus*, and *Notholæna Buchanani* were considered Natal types, though a recent specimen of the last, at Kew, establishes it for Nyassaland as well.

For Cape plants the new records are *Polygala rigens*, *Lessertia pauciflora*, *Anthospermum ciliare*, and *Helichrysum ericæfolium*, the last new for Rhodesia but previously collected in Ngamiland; also *Senecio erubescens* and *S. rosmarinifolius*. *Croton gratissimus* is also new for Rhodesia, but has been collected in Amboland.

The tropical *Ochna Schweinfurthii* and *Hexalobus senegalensis* increase their southern limit.

Intermediate distribution is shown for *Polygala abyssinica* and *Odina Schimperi,* known only from East Tropical Africa, Transvaal and Natal, and *Pæpalanthus Wahlbergii*, known from South-east Africa, Angola, and Transvaal.

Potamogeton natans, occurring in the Matopos and on the Zambesi, is quite new for Tropical Africa ; and the Matopos is a new locality for the cosmopolitan, but rarely found, *Nitella hyalina.*

An interesting record is the genus *Pseudolachnostylis*, previously known only from Angola and German East Africa, and *Euphorbia matabelensis*, collected by Penther, is one of Pax's new types.

Twenty-three new species are described. The most interesting is perhaps the handsome grass aptly named *Erianthus teretifolius* by Dr. Stapf, which is so conspicuous on the banks and islands of the Zambesi above the Falls; and a very characteristic *Elephantorrhiza* from the Matopo Hills makes a new species in this limited genus.

LIST OF PLANTS collected in August, September, and October 1905, in the Matopo Hills and at the Victoria Falls, Zambesi, Southern Rhodesia.

[*Reference to the original description has only been given for species not included in the* '*Flora of Tropical Africa*' *or the* '*Flora Capensis.*']

ANONACEÆ.

HEXALOBUS SENEGALENSIS, *A. DC.*

Matopo Hills, kopjes. Fl. Oct. 217.

Distrib. Senegambia, Niger, Bahr-el-Ghazal.

Apparently the most southerly record for this plant. A shrub, 3–4 m., with smooth bark and glossy entire leaves, which are thrown off before flowering. Flowers yellow, sweet-scented.

ARTABOTRYS BRACHYPETALA, *Benth.*

Matopo Hills, Mtchabesi Valley. Fl. Oct. 252.

Distrib. Boruma, Tette-Zambesi, Delagoa Bay.

An evergreen shrub, or scrambles as liane by the hooked peduncles ; flowers green. This is the first record for Rhodesia.

ANONA SENEGALENSIS, *Pers.*

Matopo Hills, veld, common. Fl. Oct. 256.

Distrib. General in Tropical and Sub-tropical Africa.

MENISPERMACEÆ.

CISSAMPELOS PAREIRA, *Linn.*, var. MUCRONATA, *Engl. in Pflanzenwelt Ost-Afr.* C. p. 1011. (*C. mucronata*, A. Rich.)

Matopo Hills, veld, common. Fl. Oct. 243.

Distrib. Tropical region of Old and New World.

Var. *mucronata*, A. Rich. Tropical East Africa from the Nile to Natal.

TILIACORA FUNIFERA, *Oliver.*

Victoria Falls, Rain Forest and islands. ♂. Sept. 302.

Distrib. Type locality, collected by Sir John Kirk. Also in Mozambique District.

Liane. Smooth grey bark. Inflorescence cauline, racemes from every node up the bare stem. Flowers chocolate colour.

CAPPARIDACEÆ.

MÆRUA NERVOSA, *Oliver*, var. FLAGELLARIS, *Oliver.*

Matopo Hills. Fl. Oct. 205.

Distrib. Nyassaland, Rhodesia.

CAPPARIS TOMENTOSA, *Lam.*

Victoria Falls, Arderne Island. Fl. and Fr. Sept. 138.

Distrib. Senegambia, Senegal, Angola, Tropical East Africa.

BIXACEÆ.

ONCOBA SPINOSA, *Forsk.*

Victoria Falls, veld. Fl. Sept. 304.

Distrib. Widely distributed in Tropical Africa, also in Natal.

POLYGALACEÆ.

POLYGALA ABYSSINICA, *Fresen.*

Matopo Hills, veld. Fl. Oct. 194.

Distrib. Dr. Chodat in his monograph records the type from Abyssinia.

Apparently unrecorded for Rhodesia.

Transvaal (*fide* Herb. Bolus).

POLYGALA RIGENS, *A. DC.*

Matopo Hills, veld, general. Fl. Sept., Oct. 82.

Distrib. Transvaal, Orange Free State, Natal, Griqualand West. Apparently the most northern point from which this plant has been recorded.

SECURIDACA LONGIPEDUNCULATA, *Fresen.*, var. PARVIFLORA, *Oliver.*

Matopo Hills, veld and kopjes, general. Fl. and Fr. Oct. 244.

Distrib. Widely spread in Tropical West Central Africa, Bechuanaland and Northern Transvaal (*fide* Herb. Bolus). Apparently unrecorded for Rhodesia.

A small tree, 4–5 m. high, with long whip-like branches covered with mauve-pink blossoms. Samara-like fruit.

ELATINACEÆ.

BERGIA DECUMBENS, *Planch.*

Matopo Hills, veld, very common. Fl. Sept., Oct. 30.

Distrib. Zambesi to South Africa.

HYPERICINEÆ.

HYPERICUM LALANDII, *Choisy.*

Matopo Hills, banks of streams, general.

Distrib. Widely distributed.

GUTTIFERÆ.

GARCINIA LIVINGSTONI, *T. Anders.*

Victoria Falls, banks of rivers and islands. ♂ ♀. Sept. 114. Type locality.

Distrib. Mozambique District.

Handsome evergreen tree, ± 16 m. high at maturity, with erect trunk and compact crown. In the young form it shows a pyramidal branching habit, which, with the dark green coriaceous leaves, makes it a conspicuous object on the islands above the Falls. Flowers green and inconspicuous.

MALVACEÆ.

SIDA LONGIPES, *E. Meyer.*

Matopo Hills, veld. Fl. Sept. 79.

Distrib. Widely distributed in South Africa, also recorded for Rhodesia.

ABUTILON MATOPENSE, sp. nov.

Caulis fruticosus erectus rigidus teres pulverulentus; foliis breviuscule petiolatis ovato-cordatis e basi palmatim 7-nerviis, nerviis subtus prominentibus apice acutis margine breviter et inæqualiter serratis utrinque densissime et mollissime velutinis albidis; stipulis lanceolatis uninerviis pulverulentis caducis; floribus inter mediocres generis axillaribus pedunculatis; pedunculis unifloris apicem versus articulatis primum quam foliis brevioribus, pedunculis fructiferis ± elongatis; calycis campanulati 5-fidi lobis ovalibus 3-nerviis acuminatis externe pulverulentis intus pilosis; petalis 5 aurantiacis; tubo stamineo conico brevi; carpellis circiter 20 stellatim dispositis sparse stellatis calyce subæquilongis coalitis superne mucronatis unilocularibus bivalviis sæpissime 1-spermis, seminibus subreniformibus pubescentibus.

Species *A. fruticoso*, Guill. & Perr., affinis, differt calycibus carpellis subæquilongis, dorso conspicue 3-nerviis, petalis aurantiacis et majoribus, carpellis numerosioribus et mucronatis.

Hab. Matopo Hills, old Kaffir lands. Sept. No. 98.

The stem is 1·5–2 m. high; the leaves ± 4 cm. long and 3·3 cm. broad, the petiole ± 1 cm. long, the stipules ± 4 mm. long and 1 mm. broad; the flowering peduncles ± 2 cm. and the fruiting slightly longer; the lobes of the calyx are 8 mm. long and 5 mm. broad; the petals ± 1·5 cm. long and 1·4 cm. broad; the carpels ± 6 mm. long and 4 mm. broad.

The erect, almost woody stem, which appears clothed with leaves owing to the shortness of the petioles, and the white velvety tomentum give this plant a very characteristic appearance. The flowers, which do not exceed the leaves, are a most brilliant orange and open during the day, which, according to Dr. Masters (in Oliver, Fl. Trop. Afr. i. p. 188), is in India characteristic of *A. fruticosum* alone. It was not a common species on the hills, and was only seen where land had been laid down under cultivation.

HIBISCUS MICRANTHUS, *Linn.*, forma.

Matopo Hills. Fl. and Fr. Oct. 255.

Distrib. Widely spread in Tropical Africa, Arabia, India, Ceylon.

Shrub 1·5 m.; stem green and rather leafless. Corolla white, turning red when dried. Whole plant very viscid.

STERCULIACEÆ.

DOMBEYA ROTUNDIFOLIA, *Harv.*

Matopo Hills, veld and kopjes, general. Fl. Sept. 24.

Distrib. Rhodesia, Salisbury (*Rand*), Transvaal, Natal.

A shrub or small tree from 3–8 m. high, flowering before the leaves, very striking in flower, as the wood is completely hidden by the dense cymose inflorescences. Corolla white, suffused with pink. One of the first spring flowers.

This is quite distinct from *D. densiflora*, Planch.

MELHANIA OBTUSA, *N.E. Br. in Kew Bull.* 1906, p. 99.

Matopo Hills by stream, near the Silozi. Fl. Oct. 283.

Distrib. Rhodesia.

This plant was first collected by the Hon. Mrs. Evelyn Cecil (Bulawayo, 94. in Herb. Kew.), and this is the second record. It is a shrub about 1·5 to 2 m. high, with rigid branches and brownish leaves covered with a velvety tomentum. Flowers yellow.

HERMANNIA BRACHYPETALA, *Harv.*

Matopo Hills, veld. Fl. Sept. 7.

Distrib. Rhodesia, Transvaal.

Sends out long radiating branches which run along the ground for about a metre, forming a dense round carpet on the veld. The foliage is grey and the flowers cream-colour.

HERMANNIA VISCOSA, *Hiern.*

Matopo Hills, veld. Fl. Sept. 5.

Distrib. Rhodesia.

A dwarf erect shrub, about 2 dm. high. Very viscid foliage and reddish flowers.

MAHERNIA ABYSSINICA, *Hochst.*

Matopo Hills, Kaffir lands. Fl. and Fr. Sept., Oct. 77.

Distrib. Abyssinia, Transvaal, Cape Colony.

A procumbent perennial, with yellow flowers. Apparently the first record for Rhodesia.

TILIACEÆ.

GREWIA FLAVA, *A. DC.*, forma.

Matopo Hills, veld, general. Fl. Oct. 226.

Shrub, from 1–2·5 m. high.

TRIUMFETTA WELWITSCHII, *Mast.*

Matopo Hills, veld, general. Fl. and Fr. Oct. 261.

Distrib. Angola, Rhodesia.

A herbaceous perennial, 0·5 m. high, sending up graceful flowering shoots, singly or in tufts, towards the end of the dry season; these are succeeded by the vegetative shoots which developing unchecked during the rains, die down again in the autumn. This is characteristic for many of the veld plants.

CORCHORUS HIRSUTUS, *Linn.*
Matopo Hills. Fl. and Fr. Oct. 237.
Distrib. Widely spread in the Tropics.

CORCHORUS MUCILAGINEUS, sp. nov.

Fruticulus humilis, procumbens, hirsutus, sub lente pilis unicellularibus instructus, ramis divaricatis; foliis petiolatis, stipulis petiolo 1½plo longioribus, subulatis pilosis setaceis, deciduis, lamina lineari-lanceolata, grossiuscule serrata, apice acuta, basi subcordata, penninervi, nervis lateralibus subtus valde prominentibus utrinque 7–12, valde pilosis margine ciliolata; umbellis oppositifoliis, 2–4-floris, pedicellis 1–1½plo quam pedunculis longioribus; sepalis 5 lanceolatis pilosis; floribus polyandris, petalis 5 late obovatis angustis et breviter unguiculatis, supra unguem margine puberulis calyce vix brevioribus; staminibus quam petalis brevioribus; ovario quam calyce ⅓ breviore, trigono, piloso triloculari, ovulis in quoque loculo numerosis; stylo antheris subæquilongo.

Species ab *C. serræfolio*, Burch., differt valde hirsuto foliis multe minoribus et æqualiter serratis, nerviis conspicue albis, floribus minoribus.

Hab. Matopo Hills, sandy veld between kopjes. Fl. Sept. 8.

Simple branches 6–15 cm. long, later becoming longer; leaves alternate, petioles 2 mm. long and pilose; stipules 3 mm. long; blade rough, 4 cm. long, 1 cm. broad in the middle; the peduncles with the pedicels are 6 mm. long and hirsute; the bracts are 3 mm. long, equalling the flowers, subciliate and subulate, long and finely acuminate; buds pyriform; sepals 1–2 mm. long, membranous, pilose; the petals are yellow, 1–3 mm. long; stamens 4 mm. long, with yellow filaments, and the anthers are dorsifixed; disc hypogynous entire, margin papillose; ovary and style 6 mm. long; ovary hirsute, 1½ mm., style glabrous with capitate, three-lobed stigma; capsule, very young, hirsute.

This plant is a small woody perennial, with prostrate branches and inconspicuous yellow flowers. The leaves are dark green in colour and interesting in structure, their vascular system being enclosed in abundant water-storage tissue, which accounts for the prominence and whiteness of the veins. In transverse section, the structure of the leaf resembles that of some grasses, the palisade-tissue of the lamina terminating abruptly on each side of the midrib. Large mucilage-canals occur in the stem, leaves, and the ovary-wall.

Only one specimen of this plant was seen.

MALPIGHIACEÆ.

SPHEDAMNOCARPUS GALPHIMIÆFOLIUS, *Szyszyl. Polypet. Rehm.* (1882) p. 2.

Matopo Hills, Silozi. Fl. Oct. 281.

Distrib. Transvaal.

Apparently not recorded for Rhodesia.

GERANIACEÆ.

MONSONIA BURKEANA, *Planch.*

Matopo Hills, veld. Fl. Oct. 222.

Distrib. Transvaal, Rhodesia.

RUTACEÆ.

THAMNOSMA AFRICANUM, *Engl.*, var. RHODESICUM, *Baker f. in Journ. Bot.* xxxvii. (1899) p. 426.

Matopo Hills, veld, very common. Fr. Sept., Oct. 310.

OCHNACEÆ.

OCHNA ANTUNESII, *Engl. & Gilg, in Baum, Kunene-Zambesi Exp.* p. 304.

Victoria Falls, veld. Fl. Sept. 305.

Distrib. Kunene District.

Small tree, 6 m. high, flowering with leaves, bearing pendent racemes of bright yellow flowers at every node on the branches.

OCHNA SCHWEINFURTHIANA, *F. Hoffm. Beit. zur Kennt. Fl. Cent.-Ost-Afr.* p. 20, *ex descript.*

Matopo Hills, veld and kopjes. Fl. and Fr. Oct. 218.

Distrib. Central East Africa.

Small tree with roundish crown, flowers on old wood with young leaves; corolla yellow. First record for Rhodesia.

BURSERACEÆ.

COMMIPHORA sp.

Matopo Hills, kopjes, general. Fl., with immature leaves, Oct. 197. Also at the Victoria Falls.

A small tree, always growing between rocks, sparingly branched. It forms one of the most striking vegetative objects in the dry season, in the Matopo Hills and on the Zambesi gorge below the Victoria Falls, on account of the light papery bark, which is constantly peeling off in thin laminæ, showing the green cortex beneath. The leaves are 7-foliate, and the flowers ☿, sessile, aggregated towards the top of the peduncle, which at first very short, subsequently elongates considerably. There is an unnamed specimen of this plant in the Kew Herbarium, collected by Mr. T. Baines on the Shashi river, Rhodesia. It is probably a new species, but the available material is not sufficiently mature to permit of description.

MELIACEÆ.

TURRÆA RANDII, *Baker f. in Journ. Bot.* xxxvii (1899) p. 427.

Matopo Hills, veld and kopje, very common. Fl., Sept. Fr., Oct. 2.

Distrib. Rhodesia.

Shrub, 2–6 m. high; thick-stemmed and not much branched; flowers on old wood after throwing off last year's leaves, but in shady situations leaves were found persisting. Petals green. Staminal tube yellow. Ovary 8–10-locular. Fruit yellow.

TRICHILIA EMETICA, *Vahl.*

Victoria Falls, Rain Forest, islands and banks of river above the Falls, kloofs of lower Zambesi Gorge. Fl. Sept. 110.

Distrib. Widely distributed in Tropical Africa, also in Arabia.

A handsome tree, flowers green, sweet-scented, on old wood. Evergreen in shade, but in exposed situations all the leaves were thrown off on flowering.

OLACINEÆ.

OLAX DISSITIFLORA, *Oliver.*

Matopo Hills, veld and kopjes, general, and at the Victoria Falls, veld and banks of river. Fl. Oct. 263.

Distrib. Mozambique District and Madagascar.

Shrub to small tree, 5–6 m., of graceful habit, with light-green shining leaves. Flowers white.

XIMENIA CAFFRA, *Sond.*

Victoria Falls, veld, and Matopo Hills, veld, general. Fl. Sept., Oct. 130.

Distrib. Transvaal.

CELASTRINEÆ.

HIPPOCRATEA OBTUSIFOLIA, *Roxb.*

Victoria Falls, islands and banks of Zambesi above the Falls, also kloofs of lower gorge. Fl. Sept. 139.

Distrib. Tropical Asia, Africa, and Australia.

SAPINDACEÆ.

PAULLINIA PINNATA, *Linn.*

Victoria Falls, banks of river and islands. Fl. and Fr. Sept. 124.

Distrib. Widely distributed.

CARDIOSPERMUM CORINDUM, *Linn.*

Matopo Hills, veld. Fl. and Fr. Sept., Oct. 78.

Distrib. Wide in the Tropics. Collected by Baum, Kunene-Zambesi Expedition. Carefully compared with authentic material in the British Museum.

ANACARDIACEÆ.

ODINA EDULIS, *Sond.*

Matopo Hills, veld, general. Fl. Sept., Fr. Oct. 71.

Distrib. Transvaal, Natal.

Perennial, with large pinnate leaves. The axillary racemes of yellow flowers appear first on a level with the ground; as the shoot elongates, the leaves unfold. It grows from a branching root system, forming patches on the veld.

ODINA SCHIMPERI, *Hochst.*

Matopo Hills, kopjes, general. ♂. Oct. 268.

Distrib. Abyssinia, Rhodesia.

Small tree, flowers before leaves.

SCLEROCARYA CAFFRA, *Sond.*

Matopo Hills, veld. Fl. Oct. 261.

Distrib. Lake Nyassa, Mozambique District, Transvaal, Madagascar.

RHUS LANCEA, *Linn.*

Matopo Hills, veld and kopjes, general. Fl. and Fr. Sept. 1.

Distrib. Transvaal, Cape Colony.

RHUS VILLOSA, *Linn. f.*

Matopo Hills, veld, general. Fl. Oct. 247.

Distrib. Widely spread in Tropical and Sub-tropical Africa.

Evergreen shrub, with drooping branches and pubescent leaves. At the American Mission I was told that the fruit was edible and made excellent jam.

CONNARACEÆ.

BYRSOCARPUS COCCINEUS, *Schum. et Thonn.*, var. β. (B. parvifolius, *Planch.*)

Victoria Falls, islands and banks of river. Fl. Sept. 154.

Distrib. Sierra Leone, Senegambia, Upper Guinea.

Shrub, 2 m. high, flowering before leaves. White flowers, in small axillary racemes.

LEGUMINOSÆ.

LOTONONIS LEOBORDIA, *Benth.*

Matopo Hills, veld. Fl. Sept. 19.

Distrib. Africa, from Abyssinia to the Cape. Asia, Persia, Beluchistan (Desert species).

LISTIA HETEROPHYLLA, *E. Meyer.*

Matopo Hills, general, veld and banks of streams.

Distrib. Transvaal, Natal and Eastern Provinces.

CROTALARIA (§ Oocarpæ) FLAVICARINATA, *Baker fil.*, sp. nov.

Caulis erectus suffruticosus in longitudinem striatus virgatus pauciramosus tenuiter pubescens sparsiuscule foliosus; foliis breviuscule petiolatis trifoliolatis, foliolis oblongis vel lanceolato-oblongis brevissime petiolulatis subtus strigoso-pubescentibus costa subtus prominente apice mucronatis; stipulis parvis pubescentibus lanceolatis; racemis laxis paucifloris vel multifloris axillaribus quam foliis longioribus; bracteis parvis; floribus pedicellatis inter mediocres generis pedicellis tenuibus pubescentibus pedicellis in medio bracteolatis; calycis tubo campanulato extra pubescente, segmentis lanceolatis acuminatis; corolla calycem pluries excedente, vexillo violaceo striato extra pubescente supra unguem brevem insigniter bicalloso, alis violaceis quam vexillo brevioribus inæquilateraliter oblongis unguiculatis, carina in rostrum attenuata naviculari rectangulo-curvata lutea; stylo supra ovarium abrupte inflexo tenuiter barbato, ovario subsessile circ. 14-ovulato; legumine ellipsoideo.

Species *Crotalariæ distanti*, Benth., aliquanto affinis, differt floribus multioribus, &c.

Hab. Islands of Zambesi or Victoria Falls.

L. S. Gibbs, No. 168. Flowers end of September. Herb. Mus. Brit.

" A bush growing on the outskirts of the Rain Forest, Victoria Falls" (*C. Allen*, No. 31. Herb. Kew.).

Shrub, about 2 m. high; folioles 2·0–4·0 cm. long and 7–10 mm. broad, petioles ± 1·0–1·8 cm. long: vexillum ± 1·5 cm. long; legume 2·3–2·4 cm. long.

INDIGOFERA CRYPTANTHA, *Benth.*
Matopo Hills, veld. Fr. Sept. 303.
Distrib. Transvaal.
Not recorded before for Tropical Africa.

TEPHROSIA LURIDA, *Sond.*
Matopo Hills, on kopje. Fl. and young Fr. Oct. 249.
Distrib. Rhodesia, Transvaal, Cape Colony.

LESSERTIA PAUCIFLORA, *Harv.*
Matopo Hills, veld. Fl. and young Fr. Sept. 104.
Distrib. Cape Colony, Namaqualand.
A spreading perennial, flowers pink.

ÆSCHYNOMENE CRISTATA, *Vatke, in Oest. Bot. Zeit.* xxviii. (1878) p. 215.

Victoria Falls, islands and banks of rivers, growing amongst Phragmites. Fl. and Fr. Sept.

Distrib. Angola, Mozambique District, Central Tropical Africa, also in Madagascar.

Shrub, 2 m. high, with erect branches; flowers large, pendulous, orange-yellow, with green keel. Young stems and inflorescence glandular.

ABRUS PRECATORIUS, *Linn.*
Victoria Falls, islands. Fr. Sept. 306.
Distrib. Tropics of Old and New World.

The bright red seeds with black hilum are generally called "lucky beans," and are valued for decorative purposes.

Erythrina latissima, *E. Meyer*.

Matopo Hills, general, veld and kopjes. Fl. and young Fr. Sept., Oct. 73.

Distrib. Natal, Transvaal.

Small tree, with spreading top, flowering before leaves, each branch terminating with an erect raceme of brilliant red flowers. The old wood is spinous, and the bark scales off, showing a green cortex underneath. The popular name is "Kaffir boom."

Vigna luteola, *Benth.*, var. *β.* **villosa**, *Baker*.

Victoria Falls, banks of rivers and islands. Fl. Sept. 142.

Distrib. Widely spread in Tropical Africa, Natal.

Twines amongst reeds fringing water's edge.

Vigna triloba, *Walp.*, forma.

Matopo Hills, general. Fl. Sept. 206.

Differs from type in the stipules. Corolla large, purple.

Distrib. Tropical Africa, Cape.

The above species would both be included in the genus *Liebrechtsia*, De Wildem. (Fl. Katanga, p. 70).

Rhynchosia resinosa, *Hochst.*

Matopo Hills, amongst rocks, general. Fl. Sept., Oct. 68.

Distrib. Abyssinia, Uganda, Nyassa.

Stem twines, but the flowers occur on arrested lateral shoots, giving a shrubby appearance. Peduncles and calyx very viscid. In the dry season, in exposed situations, this plant shows a drought condition, the leaves curl up and the corollas do not expand.

Pterocarpus angolensis, *A. DC.*

Matopo Hills, veld and kopjes. Fl. Oct. 207.

Distrib. Angola, Transvaal.

Large tree, with flat crown, flowering before the leaves; flowers orange-yellow, in short few-flowered, erect racemes, terminating the branches. *P. angolensis*, A. DC., which has often been quoted as a synonym of *P. erinaceus*, Lam., is easily distinguished by the larger flowers and much larger fruit, which has more bristles in the centre and a broader wing.

Bolusanthus speciosus, *Harms, Rep. Nov. Spec. Reg. Veg.* ii. p. 15.

Victoria Falls, veld. Fl. Sept. 126. Also in the Matopo Hills. Fl. Oct.

Distrib. Rhodesia, Transvaal, Delagoa Bay.

A small tree, 6–7 m. high, branching towards the top. Flowers deep purple, scentless in pendent axillary racemes on the new wood, coming out with the young leaves. (Rhodesian Wistaria.)

PELTOPHORUM AFRICANUM, *Sond.*
Matopo Hills, veld. Fl. Oct. 307.
Distrib. Angola, Rhodesia, Transvaal.

PTEROLOBIUM LACERANS, *R. Br.*
Matopo Hills, kopjes, general. Fr. Sept. 81.
Distrib. Abyssinia, German East Africa, Transvaal (*fide* Herb. Bolus).

A scrambling shrub, scrambling by the recurved stipular spines. The erect racemes of brilliant red samaroid fruit are conspicuous above the dense mass of foliage.

GLEDITSCHIA AFRICANA, *Benth.*
Victoria Falls, veld (Hotel compound). Fl. Sept. 137.
Distrib. Angola.

Tree with flat spreading crown and pendent racemes of inconspicuous greenish-yellow flowers.

CASSIA GRANITICA, *Baker f. in Journ. Bot.* (1905) p. 45.
Matopo Hills, veld and kopjes, general. Fl. Oct. 97.
Distrib. Rhodesia.

CASSIA MIMOSOIDES, *Linn.*
Matopo Hills, veld, old Kaffir lands. Fl. and Fr. Oct. 251.
Distrib. Widely distributed in the Tropics.

AFZELIA CUANZENSIS, *Welwitsch.*
Matopo Hills, veld and kopjes, general. Fl. Oct. 275.
Distrib. Angola, East Tropical Africa, Transvaal.

Handsome tree with flat spreading crown and drooping leaves. Flowers green, the two anterior stamens united to form one large petaloid staminode. Very sweet-scented. (Mahogany bean.)

BRACHYSTEGIA APPENDICULATA, *Benth.*
Victoria Falls, veld (Hotel compound). Fl. Sept. 145.
Distrib. Mozambique District, South Central.

Large tree with spreading crown; flowers small, green, sweet-scented, attractive to moths.

COPAIFERA COLEOSPERMA, *Benth.*

Victoria Falls, veld (Hotel compound). Fr. Sept. 144.

Distrib. South Central Africa.

Evergreen tree, wood red. Seeds ex-arillate in this specimen. Popular name, "Rhodesian teak."

COPAIFERA MOPANE, *Kirk.*

Veld, south of Matopo Hills. In leaf Oct. 204.

Distrib. Angola, Mozambique District, Rhodesia.

BURKEA AFRICANA, *Hook.*

Victoria Falls, also Matopo Hills, veld, common. Fl. Oct. 143.

Distrib. Upper Guinea, Rhodesia, Transvaal.

ELEPHANTORRHIZA RUBESCENS, sp. nov.

Frutex ramis validis rufescentibus, erectis, glabris inermibus; foliis juvenilibus 3-pinnatis, paripinnatis, foliolis 19–21-jugatis, acutis, lamina subciliata inæquilatera; racemis spiciformibus subdensis, rhachi 4-angulato, tenuiter alato; floribus spicatis, breviter pedicellatis; pedicellis articulatis; calyce infundibuliformi, breviter 5-dentato, purpureo; petala libera, oblongo- lanceolata subacuta glabra; antheris 10, glandulis stipulatis deciduis flavis, antisepalis minoribus quam antipetalis, antheris et filamentis flavis; ovario sessili oblongo, glabrato purpureo, ± 15-spermo; stylo filiformi, purpureo, stigmate filiformi.

Species *E. Petersianæ*, Bolle, affinis, differt glandulis flavis, stylo longiori, staminibus inæquilongis, inflorescentia multoties minore.

Hab. Matopo Hills, base of kopjes. Fl. Oct. 184.

Shrub, about 1·5 m. high, with the rhachis of the leaf 3·5 cm. long, and that of the leaflets 4 cm. long, leaflets 6 m. long; the raceme is 7–8 cm. long; calyx 3 mm. long; petals 3 mm. long; the antisepalous filaments are 6 mm. and the antipetalous are 5 mm. long, the anthers are 1 mm. long; the ovary and style 4·5 mm. long, and the ovary is 2 mm. long.

Shrub, flowering before leaves on old wood. Spicate inflorescences crowded towards tops of branches. In type specimen there are two or three young leaves just expanded. The whole plant is very striking during the flowering stage owing to the deep red, almost purple colour of stem and inflorescence, the stamens alone being yellow. No fruit was seen.

ALBIZZIA sp.

Matopo Hills, kopjes. Fl. and old Fr. Oct. 198.

A small tree with smooth grey bark, flowering before leaves on old wood. Flowers white, in dense round heads with stalks about 5 cm. long. The legume is membranous and four-seeded. As there are no leaves, it is difficult to determine this species with accuracy, but the flowers do not agree with any material in the British Museum or Kew Herbaria.

The following is probably another species, but fruit is required for determination.

Matopo Hills, veld and kopjes, general. Fl. Oct. 187.

A small tree, about 7 m. high, with spreading crown and rough dark bark. The leaves are 3-jugate with falcate pinnæ. The flowers are white, densely capitulate, on long axillary peduncles. This seems a very distinct species, which could not be matched at the British Museum or Kew Herbaria.

ACACIA WELWITSCHII, *Oliver.*

Victoria Falls, veld (Hotel compound). Fl. Sept. 128.

Distrib. Angola, Mozambique District.

Large tree, with flat crown. Flowers pink, with pink rhachis to raceme.

ROSACEÆ.

PARINARIUM MOBOLA, *Oliver.*

Matopo Hills, veld, general. Fl. and Fr. Sept., Oct. 64.

Distrib. Tropical Africa, Transvaal.

One of the finest trees, with long trunk, symmetrical crown, and evergreen leaves. The inflorescences terminate each branch. Flowers white, sweet-scented. Locally called "Hissing-tree"; native name "Mkuna."

SAXIFRAGACEÆ.

VAHLIA CAPENSIS, *Thunb.*

Matopo Hills, veld. Fl. Oct. 308.

Distrib. Kunene District, Rhodesia, and throughout South Africa.

HAMAMELIDEÆ.

MYROTHAMNUS FLABELLIFOLIA, *Welwitsch.*

Matopo Hills, kopjes, common; also at the Victoria Falls. Sept. 309.

Distrib. Angola, Mozambique District, Rhodesia, Transvaal.

Grows abundantly in shallow pans on granite. This plant shows characteristic drought condition. The leaves fold up and are pressed against the stem enclosing the flower catkins, and the branches curl over, looking like dead wood. On the first shower of rain, the leaves unfold and a plant is often seen one half dried up and the other half with green leaves. Soaking in water also causes the leaves to unfold.

COMBRETACEÆ.

COMBRETUM RHODESICUM, *Baker f. in Journ. Bot.* xxxvii. (1899) p. 435.

Matopo Hills, veld, general. Fl. and Fr. Oct. 267.

Distrib. Rhodesia.

This is a form differing from type in the fruit being slightly shorter.

COMBRETUM ZEYHERI, *Sond.*

Matopo Hills, veld. Fl. Oct. 221.

Distrib. Transvaal, Rhodesia.

COMBRETUM OATESII, *Rolfe, in Oates, Matab.* App. p. 399, pl. 10.

Matopo Hills, veld, general. Fl. Sept.

Distrib. Nyassaland, Rhodesia.

Another species of this genus was collected at Victoria Falls, veld. Fl. and Fr. very young, Sept. 134. It was a small tree about 6 m. high, flowers with leaves on young wood. Judging from the very young fruit, this plant belongs to Engler and Diel's section Chionanthoideæ, near *C. taitense*, Engl. The flowers are yellow with comparatively large, 5-dentate petals.

COMBRETUM sp.

Victoria Falls, veld, general. Fl. only, Sept. 127.

A straggling shrub, with long branches, inclined to scramble. A lovely sight in flower, as the bare stems are almost covered by the dense elongated racemes of white flowers with exserted red stamens. This species comes into the section Trichopetalæ, and

in structure of the flower agrees with *Combretum quangense*, Engl. & Diels, in all points but the petals, which are longer clawed (I am inclined to think this is a variable feature); but in habit, viz., flowering before leaves and the very secund racemes, it seems to approach *C. longispicatum*, Engl. ex desc.

TERMINALIA SILOZENSIS, sp. nov.

Frutex vel arbuscula ramosus, ramis juvenilibus cortice nigrescente instructis sursum puberulis demum glabris sparsiuscule foliosis vel ad apices ramorum foliis subcongestis; petiolo nullo, foliis fere amplexicaulibus, lamina novella albida velutina, adulta præter costam latam pilosam glabrescente papyracea, supra saturate viridi subtus flava glauca, obovato-lanceolata, apice obtusa vel ± acuminata, nervis pilosis vix conspicuis 9–12 utrinque adscendentibus, subtus purpurascentibus, venisque tenuissime reticulatis; racemis axillaribus pedunculatis, folium æquantibus vel longioribus, rhachi glabrescente, purpurascente; bracteis membranaceis extra pubescentibus, receptaculum inferius æquantibus; floribus brevissime pedicellatis; receptaculo extra pubescenti albido, inferiore obconoideo superiore divergente; disco longissimo barbato; calycis segmentis extra pilosis intus pubescentibus triangularibus acuminatis; staminibus longe exsertis; stylo glabro basi sparse et longe piloso; fructu pedicellato ambitu ovali alato, basin versus attenuato, apice emarginato vel apiculato, glabrato brunnescente.

Species *T. brachystemmæ*, Welwitsch, affinis a qua differt primo intuitu foliis minoribus et angustioribus, racemis longioribus folia excedentibus vel iis subæquilongis, staminibus and Fr. exsertis.

Hab. Matopo Hills, Silozi, sandy veld between kopjes. Fl. and Fr. Oct. 277.

Small tree or shrub, 3–4 m. high; leaves 6–8 cm. long, 2·5–3·2 cm. broad; racemes 6·5–7·5 cm. long; peduncles 3 cm. long; upper receptacles 3 mm. long, lower receptacles 4 mm. long and over 1 mm. broad; calyx-lobes 2 mm. long and over 2 mm. broad at the base of lobe; filaments 4 mm. long; anthers $\frac{3}{4}$ mm. long; style 5 mm. long; fruiting pedicel 5 mm. long.

This species is characteristic in habit, with erect branches, evergreen; it flowers on the young wood. The leaves are scattered on the flowering shoots, with single racemes in their axils. The spikes of white flowers stand up well against the light green glaucous leaves.

LYTHRACEÆ.

ROTALA LONGISTYLA, sp. nov.

Habitu omnino *Rotalæ cordifoliæ*, Baker; caules ascendentes e basi repente et radicante orti; foliis oblongis ternis sessilibus, glabris, margine integris, apice obtusis, in parte inferiore quam internodiis longioribus, in parte superiore brevioribus; floribus in axillis euphyllorum solitariis; bracteis 2 minuscule puberulis; calyce exappendiculato, subtubuloso-campanulato, corollino-scarioso 4-lobo, lobis triangularibus acutis, fundo annulo nectarifero munito; petalis roseis, caducis, late ovatis, apice rotundatis, sessilibus; staminibus 3, episepalis non exsertis; ovario substipitato verisimiliter 2-loculari in quoque loculo pluriovulato; stylo manifeste longiusculo, stigmate capitato.

Species *R. cordifoliæ*, Baker, affinis a qua differt foliis basi non cordatis, petalis sessilibus, latioribus, majoribus et stylo longiori.

Hab. Victoria Falls, bog edge of Rain Forest, Sept. 170.

In this plant the stems vary in length according to situation, those of our specimen being 5–6 cm. The leaves are 4 mm. long and just over 1 mm. broad; the flower-bracts are 1 mm. long; the calyx 3 mm. long to tip of segments and 1½ mm. broad; the stamens are inserted about halfway up the tube, the filaments are 1 mm. long, and the anthers ½ mm. long; the ovary is 1 mm. long and less than 1 mm. broad, and the style with stigma 2 mm. long.

A small perennial herb, forming dense patches in open spaces, but growing amongst grass the branches are drawn up and longer. It is abundant on the open grass edge of the Rain Forest, but does not penetrate under the trees It was not observed anywhere else. *Rotala cordifolia*, Baker, the nearest ally of the above, is a Madagascar plant, described in the Journ. Linn. Soc., Bot. vol. xxii. (1887) p. 478. A plant very similar to this new species (*Eyles*, 24) was collected in the same locality, the only difference being that the leaves are in whorls of 4.

NESÆA FLORIBUNDA, *Sond.*

Victoria Falls, bog edge of Rain Forest. Fl. Sept. 164. Also in Matopo Hills.

Distrib. Widely spread in Tropical Africa, Transvaal, Natal.

TURNERACEÆ.

WORMSKIOLDIA LONGEPEDUNCULATA, *Mast.*

Matapo Hills, veld, common. Fl. Sept., Oct. 48. Also at Victoria Falls.

Distrib. British East Africa, Mozambique, Transvaal.

Vary variable in length of peduncle and size of leaves. Flowers only open in the sun.

CUCURBITACEÆ.

MOMORDICA BALSAMINA, *Linn.*

Victoria Falls, islands. Fl. and Fr. Sept. 299.

Distrib. Widely distributed.

FICOIDEÆ.

PHARNACIUM ZEYHERI, *Sond.*

Matopo Hills, veld, general. Sept., Oct. 45.

Distrib. Transvaal.

Apparently not recorded for Tropical Africa.

UMBELLIFERÆ.

PEUCEDANUM FRAXINIFOLIUM, *Hiern.*

Matopo Hills, kopjes; also at Victoria Falls, general. Fl. and old Fr. Sept. 83.

Distrib. Widely spread in Tropical Africa.

Tree, with white smooth bark, branches erect, bearing large terminal compound umbels of greenish-yellow flowers. The flowers appear long before the leaves and give the first green tinge to the kopjes in early spring.

ARALIACEÆ.

CUSSONIA NATALENSIS, *Sond.*

Matopo Hills, kopjes. Fl. and Fr. Sept. 107.

Distrib. Natal, Zululand.

A small tree, flowering before leaves. There is a specimen of this plant in the British Museum with leaves only, from Bulawayo (Rand).

RUBIACEÆ. (Mr. S. Moore.)

TRICALYSIA JASMINIFLORA, *Hook. f.*

Matopo Hills, general. Fl. Sept., Oct. 67.

Distrib. Nyassaland, Zambesi District, Rhodesia.

A shrub, 3–5 m. high, with rigid ascending branches and dark-green leaves, which, in exposed situations, are thrown off before flowering. Flowers white, of gardenia-like texture, very sweet-scented.

CANTHIUM ABBREVIATUM, *S. Moore* = Plectronia abbreviata, *K. Schum.*

Matopo Hills, veld. Fl. Oct. 278.

Distrib. Angola, Kunene District.

Herbaceous perennial, 2 dm. high (at flowering). Typical veld plant with branching root system, forming circular patches like *Anona senegalensis*, Pers. Flowers in the axils of the lower leaves only.

ANTHOSPERMUM CILIARE, *Linn.*

Matopo Hills, veld, general. Fl. Oct. 186.

Distrib. Cape District. First record for Rhodesia.

ANTHOSPERMUM LANCEOLATUM, *Thunb.*

Matopo Hills, amongst reeds on banks of streams. Sept., Oct. 93.

Distrib. Nileland, Mozambique District, South Africa.

COMPOSITÆ. (Mr. S. Moore.)

ERLANGEA SCHINZII, *O. Hoffm. in Bull. Herb. Boiss.* i. (1893) p. 71.

Victoria Falls, islands. Fl. Sept. 298.

Distrib. West Africa.

An annual erect herb, about a metre high, with purple flowers. This record increases the known radius of this species, which was considered a south-western one.

VERNONIA KRAUSSII, *Sch. Bip.*

Matopo Hills, veld, general. Fl. Oct. 342.

Distrib. Rhodesia, Betchuanaland, Transvaal, Natal.

VERNONIA PODOCOMA, *Sch. Bip.*

Matopo Hills, gorge near the "View." Fl. and Fr. Sept. 66.

Distrib. Abyssinia, Mozambique, and Zambesi Districts, Transvaal (*fide* Herb. Bolus).

A very handsome perennial, 2–3 m. high. Simple erect stems clothed with leaves all the way up, and a large terminal panicle of mauve flowers.

Brachylæna rhodesiana, *S. Moore*, sp. nov.

Arbuscula a basi ramosa, ramulis foliosis, tomentellis, deinde glabrescentibus; foliis pro rata mediocribus, oblongo-oblanceolatis, integris, apice obtusis sæpius obtusissimis, basin versus in petiolum brevem sensim angustatis, chartaceis, supra griseo-araneosis mox glabrescentibus, subtus subtiliter tomentosis, costis secundariis utrinque 5–7, angulis variis insertis, fac. sup. subplanis, fac. inf. prominentibus; capitulis mediocribus, in paniculis thyrsiformibus ramulos terminantibus brevibus (sc. quam folia brevioribus et ♀) vel longioribus et ♂ subtiliter tomentosis digestis, masculis circa 23 femineis 10-flosculosis; pedunculis propriis satis abbreviatis; involucri campanulati phyllis utriusque sexus 6–7-seriatis, exterioribus perbrevibus, ovatis vel ovato-oblongis, interioribus longioribus, sensim angustatis, omnibus obtusis necnon margine ciliolatis; flosculis exsertis; corollis omnibus 5-lobis; staminibus exsertis; fll. ♂ stylis sursum incrassatis, biramosis, fll. fem. exsertis; achæniis parvis, cylindricis, appresse pubescentibus, quam pappus biseriatus scabridus sordidus multo brevioribus.—A *B. huillensi*, O. Hoffm., mihi descriptione solummodo cognita optime distinguenda propter folia obtusa vel obtusissima nec acuminata, capitula plurifloseulosa (illa sp. memorati modo 5-flosculosa), corollas minores, achenia parva. *B. rotundata*, S. Moore, præterquam folia basi rotundata involucrum plane dispar ostendat.

Hab. Matopo Hills, kopjes. Sept. 72.

A small tree 4 m. high. Leaves 4–5·5 cm. long, 1·5–2·5 cm. broad, in the dry state yellowish-brown above and pale yellow-grey below; petioles 4 mm. long, tomentose; male panicles up to 8 cm. long and 3–4 cm. in diameter; female 3 by 2 cm. Proper peduncles seldom reaching 5 mm. long; male heads 7 by 6 mm., female 1 cm. by 7 mm.; outermost involucral leaves $\frac{3}{4}$–1 mm. long, intermediate 1½ to 2⅓ mm., innermost nearly 4 mm. long; male corollas 5 mm. long, their revolute lobes 2½ mm.; female corollas 4 mm. long with lobes only ¾ mm.; male style-arms lanceolate, ½ mm. long, female ovate-lanceolate, ¾ mm.; achenes about 3 mm. long, pappus 6 mm., but of the male flowers only 4 mm.

A handsome shrub or small tree, with silvery leaves and yellow flowers. Generally flowers after throwing off the leaves, but in shade the leaves were found persisting, especially on the ♂ plants.

TARCHONANTHUS CAMPHORATUS, *Linn.*

Matopo Hills, veld, common. ♀. Sept. 315.

Distrib. Tropical and South Africa, Arabia.

A graceful aromatic shrub, diœcious, the racemes of the ♀ are inclined to droop, those of the ♂ being erect. This plant shows a drought condition, the leaves curling and appearing quite dried up in the dry season.

BLUMEA LACERA, *DC.*

Matopo Hills, banks of streams. Fl. Sept. 269.

Distrib. Widely distributed in Tropical and South Africa; also Asia and Australia.

BLUMEA GARIEPINA, *DC.*

Matopo Hills, Kaffir lands. Fl. Sept.

Distrib. Rhodesia, Betchuanaland, Transvaal.

DENEKIA CAPENSIS, *Thunb.*

Matopo Hills, in sand by streams. Annual. 39; and at Victoria Falls, exmerged rocks, perennial. Fl. Sept. 156.

Distrib. Angola, Rhodesia, and general in South Africa.

EPALTES GARIEPINA, *Steetz.*

Matopo Hills, veld, general. Fl. Oct. 195.

Distrib. Abyssinia to Rhodesia, and South Africa

GNAPHALIUM LUTEO-ALBUM, *Linn.*

Matopo Hills, sandbanks by streams. Fl. Sept. 40.

Distrib. Cosmopolitan.

HELICHRYSUM ERICÆFOLIUM, *Less.*

Matopo Hills, veld, Matopo Hotel, No. 2. Fl. Sept. 10.

Distrib. Ngamiland, South Africa; apparently first record for Rhodesia.

HELICHRYSUM LEPTOLEPIS, *DC.*

Matopo Hills, veld, Matopo Hotel No. 2. Fl. Sept. 11.

Distrib. Rhodesia, South-east Africa.

HELICHRYSUM ARGYROSPHÆRUM, *DC.*

Matopo Hills, veld, Matopo Hotel, No. 2. Fl. Sept. 27.

Distrib. South Tropical and South Africa.

SENECIO TENELLULUS, *S. Moore*, sp. nov.

Herba annua, tenella, glabra; caule ascendente, gracili, deorsum

sparsim folioso, sursum nudo; foliis sessilibus, anguste oblongis vel anguste lineari-oblanceolatis, obtusis, uninervibus, leviter carnosulis; capitulis parvis homogamis, 12–14-flosculosis, in corymbo longipedunculato laxo tricephalo raribracteato digestis; pedunculis propriis capitula longe excedentibus, gracilibus; involucri cylindrico-infundibuliformis ecalyculati phyllis 8, lineari-oblongis, obtusis, apice vero pubescentibus dilute viridibus tenuiter nervosis; flosculis breviter exsertis purpureis; styli ramis elongatis truncatis, penicillatis; achæniis valde crudis angustissimis, compressiusculis, glabris; pappi setis scabriusculis albis.—Juxta *Sen. Baumii*, O. Hoffm., inserendus cujus folia sat similia, capitula equidem 25-flosculosa diversa, *e. g.* involucri latioris phylla breviora, omnimodo glabra, extra plane striata, corolla lobi longiores, &c.

Hab. Matopo Hills, bog near "View." Oct. 203.

Whole plant at most 30 cm. high. Leaves 3·0–4·0 × 0·2–0·25 cm., the very few scattered highest ones narrowly linear. Peduncle about 6 cm. long; proper peduncles of fully mature capitula 3·0-3·5 cm. long; bracts very narrowly linear, ± $2\frac{1}{2}$ mm. in length; capitula 1·1 cm. long, 0·4 cm. in diameter, gradually narrowing towards the base; involucral leaves 1·0 cm. long and ± 1·0 mm. in width; corollas 8 mm. long; the tube very slender but slightly enlarged immediately under the limb, of which the lobes are only 1·0 mm. long; anthers entire at base; style-arms nearly 3·0 mm., achenes 3·0 mm., pappus 7·0 mm. long.

SENECIO ERUBESCENS, *Ait.*

Matopo Hills, vlei ground, general. Fl. Oct. 241.

Distrib. Transvaal, Natal, Cape Colony. First record for Tropical Africa.

A herbaceous perennial with dark violet flowers.

SENECIO LASIORHIZUS, *DC.*

Matopo Hills, veld, general. Fl. Sept. 189.

Distrib. Angola, British Central Africa, Rhodesia.

A herbaceous perennial, with handsome yellow heads of flowers which precede the large radical leaves.

SENECIO ROSMARINIFOLIUS, *Linn.*

Matopo Hills, sandbanks in streams. Fl. Oct. 43.

Distrib. Cape Colony. This seems to be the first record for Tropical Africa.

SENECIO BARBERTONICUS, *Klatt, in Bull. Herb. Boiss.* (1896) p. 840. Var. MICROCEPHALA, *S. Moore*, var. nov. A typo abhorret præcipue ob capitula plane minora et pauciorflosculosa. Involucri phylla summum 1·2 cm. long. Flosculi pro capitulo 12.

Hab. Matopo Hills, Ischotje. Oct. 250.

A shrub 1·5–3 m. high, with fleshy leaves at the end of the branches, and small terminal heads of yellow flowers.

OSTEOSPERMUM MURICATUM, *E. Meyer.*

Matopo Hills, old Kaffir lands. Fl. and Fr. Sept. 22.

Distrib. Angola, Somaliland, Rhodesia, South Africa.

GAZANIA KREBSIANA, *Less.*, var. HISPIDULA, *Harvey.*

Matopo Hills, veld. Fl. and Fr. Sept. 75.

Distrib. Rhodesia, Transvaal, Orange River, and Cape Colony.

GERBERA PILOSELLOIDES, *Cass.*

Matopo Hills, vlei ground. Fl. and Fr. Oct. 257.

Distrib. Wide in Tropical and South Africa; also Asia and Tasmania.

LATUCA CAPENSIS, *Thunb.*

Matopo Hills, veld, general. Fl. and Fr. Sept. 52.

Distrib. Widely distributed in Tropical and South Africa.

CAMPANULACEÆ.

LOBELIA THERMALIS, *Thunb.*

Matopo Hills, rocky banks of Malami River Fl. Sept., Oct. 31.

Distrib. Kunene District, Rhodesia, and South Africa.

LOBELIA DECIPIENS, *Sond.*

Matopo Hills, vlei ground, general. Fl. Sept., Oct. 87.

Distrib. Rhodesia, South Africa.

LOBELIA TRULLIFOLIA, *Hemsl.*, forma.

Matopo Hills, Fort Usher, under overhanging rocks. Fl. Oct. 271.

Distrib. British Central Africa.

A pretty little carpeting annual, not rooting at the nodes. In this form the anthers are glabrous.

LOBELIA MINUTIDENTATA, *Engl. & Gilg, in Baum, Zambesi-Kunene Exp.* p. 398.

Matopo Hills, on edge of bog, where it drains over granite. Malam River. Fl. Oct. 272.

Distrib. Type locality, Chihinde, in Portuguese West Africa.

This plant was collected by Baum on the Kunene-Zambesi Expedition. My specimen is really intermediate between *L. angolensis*, Engl. & Gilg, and *L. minutidentata*, Engl. & Gilg, as it shows the less luxuriant inflorescence and slightly larger calyx of the former, while in the shape and more obscure dentation of the leaves it approaches the latter. The structure of the flower is similar in all three, and I am inclined to think these are only forms of one species.

LOBELIA FONTICOLA, *Engl. & Gilg, l. c.*

Matopo Hills, banks of Malami River, in sand. Fl. Sept. 96.

Distrib. Type locality, left bank of Chitanda River, in Port. W. Africa.

This is an interesting record of another of Baum's West African plants. It is a very characteristic little species, the whole plant white with silky adpressed hairs and very minute white flowers. Only three specimens of this species were seen by me, but it may be more abundant later on in the summer.

LOBELIA MICRODON, *A. DC.*

Matopo Hills, between rocks by river. Fl. Sept., Oct. 37.

Distrib. South Africa.

Annual, with rosette of radical leaves and erect flowering stems.

LIGHTFOOTIA TENUIFOLIA, *A. DC.*

Matopo Hills, veld. Fl. Sept. 35.

Distrib. Angola, Rhodesia (Rand).

WAHLENBERGIA CALEDONICA, *Sond.*

Matopo Hills, veld. Fl. Oct. 220.

Distrib. Rhodesia, Cape District, Betchuanaland, Transvaal.

A form with pale yellow flowers. Previously collected in Rhodesia by the Hon. Mrs. Evelyn Cecil (Inyanga, Herb. Kew.).

PLUMBAGINEÆ.

PLUMBAGO ZEYLANICA, *Linn.*

Matopo Hills, kopjes. Fl. Sept. 14.

Distrib. Tropics of Old World, Transvaal, Natal.

EBENACEÆ.

ROYENA PALLENS, *Thunb.*

Victoria Falls, veld, and in Matopo Hills. Fl. Sept. 112.

Distrib. Angola, Central and East Tropical Africa, South Africa.

EUCLEA DEVINORUM, *Hiern.*

Matopo Hills, veld, kopjes, general. ♂ ♀. Sept. 34.

Distrib. South Central Tropical and South-east Africa.

A dense evergreen shrub, with green flowers in small axillary racemes; sweet-scented.

EUCLEA MULTIFLORA, *Hiern.*

Matopo Hills, kopje. ♂. Sept. 46.

Distrib. Angola, Mozambique District, Rhodesia, South Africa.

A small evergreen shrub with white sweet-scented flowers in axillary racemes.

OLEACEÆ.

JASMINUM MAURITIANUM, *Bojer.*

Victoria Falls. Islands and kloofs of Zambesi gorge. Fl. and Fr. Sept. 111.

Distrib. West (Angola) to East Central Tropical Africa; Mozambique District.

APOCYNACEÆ.

DIPLORRHYNCHUS MOSSAMBICENSIS, *Benth.*

Matopo Hills, veld, general. Fl. Oct. 273.

Distrib. Angola, South Central Tropical Africa and Mozambique District.

A small tree, with umbels of cream-coloured flowers.

ASCLEPIADEÆ.

ASCLEPIAS FRUTICOSA, *Linn.*

Matopo Hills, banks of Malami River. Fl. and Fr. Oct. 103.

Distrib. Wide, Tropical and Subtropical Africa, Southern Europe, Arabia.

ASCLEPIAS TENUIFOLIA, *N. E. Br.*

Matopo Hills, kopjes, general, in cracks of granite. Fl. Sept. 100.

Distrib. Rhodesia.

An erect herbaceous perennial, 3 dm. high. Type specimen from the Mangwe River, S. Rhodesia (*Baines*, Herb. Kew.). This is the second record for this plant.

SARCOSTEMMA VIMINALE, *R. Br.*

Matopo Hills, general. Fl. Oct. 239.

Distrib. Upper and Lower Guinea, Nile-land, Mozambique District.

A leafless liane, forming matted masses on trees, or spreading over rock-surfaces.

LOGANIACEÆ.

NUXIA VISCOSA, sp. nov.

Arbor, dense ramosa, ramis junioribus densiuscule glanduloso-pubescentibus, mox glabratis; cortice sublaxo longitudinaliter striato; foliis ternis, breviter petiolatis (petiolis dense glanduloso-pilosis) late obovatis, apice rotundatis mucronulatis, basi rotundatis, subchartaceis utrinque glanduloso-pubescentibus, inæqualitur dentatis, margine glanduloso-ciliatis, nervis lateralibus utrinque 3–5, supra inconspicuis, subtus sat prominentibus, glanduloso-pilosis; floribus albidis, in cymis breviter pedunculatis sublaxis foliis circiter æquilongis ramulos ultimos terminantibus glanduloso-pubescentibus dispositis; bracteis setaceo-subulatis, glanduloso-pubescentibus; pedicellis calyce brevioribus; calycis glanduloso-pilosi tubo anguste cylindrico, lobis tubo plane brevioribus; corollæ lobis oblongo-ovatis, dorso puberulis; antheris exsertis horum loculis confluentibus, subparalleli-divergentibus; ovario dense sericeo; stylo exserto obtuso; capsula ignota.—Sp. *N. pubescenti*, Sond., affinis abs qua differt foliis majoribus, latioribus, glandulosis necnon manifeste dentatis, cymis brevioribus, calyce angustiore. Ab omnibus congeneribus distinctissima ob folia lata dentata glanduloso-pubescentia.

Hab. Matopo Hills, near American Mission and on the Silozi. Fl. Oct. 246.

The petiole varies from 3–5 m. in length, the lamina of the leaf is from 4·5–5 cm. long and 3·3–4·3 cm. broad; the common peduncle of the terminal cymes is only 5 mm. long, the cymes are + 6 cm. broad and 4 cm. long, the flower-pedicels are ± 2 mm. long; the calyx-tube is ± 2 mm. long and 1 mm. broad, the lobes are 1½ mm. long and just over 1 mm. broad at the base; the filaments are ± 3 mm. long and the anthers ± 1¼ mm. long;

the ovary is ± 3 mm. long and the style and stigma ± 6 mm. long.

An evergreen tree, 7–10 m. high, with a much-branched spreading crown, growing in deep holes and wide fissures of the granite. Leaves and inflorescence very viscid.

GENTIANEÆ.

CANSCORA KIRKII, *N. E. Br.*

Victoria Falls, bog edge of Rain Forest and Livingstone Island. Fl. and Fr. Sept. 152.

Type locality, collected by Sir John Kirk on Livingstone Island in 1860, and apparently not since.

A small annual with pink flowers, which were always closed. They very possibly open in the evening. It was only seen in bright sunshine.

BORRAGINEÆ.

CORDIA sp.

Matopo Hills, kopjes. Fl. and very young leaf, Oct. 199.

A small tree, with white flowers, which are borne on lateral branches on the young wood in small terminal cymes of three or four. The species is probably a new one, but the leaves are too immature to describe it.

EHRETIA HOTTENTOTICA, *Burch.*

Matopo Hills, old Kaffir lands. Fl. and Fr. Oct. 279.

Distrib. Rhodesia (Rand), South Africa.

TRICHODESMA PHYSALOIDES, *Fenzl.*

Matopo Hills, veld, general. Fl. Sept., Fr. Oct. 74.

Distrib. Nileland, Mozambique District, Nyassaland, Angola, Transvaal, Betchuanaland.

Herbaceous perennial, which sends up a tuft of flowering shoots, about 7 dm. high, from the persistent root-stock, in the beginning of spring; these are succeeded by the vegetative shoots, about 1 m. high, which develop during the rainy season. It is a very handsome plant with large white flowers and glaucous green foliage, gregarious.

CONVOLVULACEÆ. (Dr. Rendle.)

MARREMIA ANGUSTIFOLIA, *Hailier f.*

Matopo Hills, veld. Fl. Oct. 228.

Distrib. Tropical and South Africa

ASTROCHLÆNA MALVACEA, *Hallier f.*, var. EPEDUNCULATA, *Rendle.*

Matopo Hills, veld and kopjes, general. Fl. Oct. 84.

Distrib. Rhodesia.

In this specimen the flowers are single in the axils of the leaves; but as it was collected at the very commencement of the flowering period, this fact is probably due to less luxuriance of growth. The root-stock is perennial, sending out long shoots which run over the ground and bushes, and on these the flowers appear as soon as they start growth. The leaves and stems are covered with a white tomentum, the flowers are mauve.

IPOMŒA OBSCURA, *Ker.*

Matopo Hills, veld. Oct. 248.

Distrib. Wide.

SCROPHULARINEÆ.

APTOSIMUM LINEARE, *Marl. & Engl.*

Matopo Hills, veld. Fl. Sept. 13.

Distrib. Angola, Mozambique District, South Africa.

NEMESIA AFFINIS, *Benth.*

Matopo Hills, Malami River. Fl. Sept. 49.

Distrib. German South-west Africa, Namaqualand, Cape District.

NEMESIA FŒTENS, *Vent.*

Matopo Hills, Malami River, sand-banks. Fl. Sept. 312.

Distrib. Rhodesia, Transvaal, Natal, Cape Colony.

This plant has been collected near Bulawayo (*Eyles*, Brit. Mus.).

DICLIS PETIOLARIS, *Benth.*

Matopo Hills, Malami River, sand-banks. Fl. Sept. 76.

Distrib. Lower Guinea, Mozambique District, South Africa.

SUTERA MICRANTHA, *Hiern.*

Matopo Hills, Malami River, sand-banks. Fl. Sept. 36.

Distrib. Central Africa, Mozambique District, Transvaal, Swaziland.

An annual plant, with unpleasantly aromatic foliage and small yellow flowers.

SUTERA BURKEANA, *Hiern.*

Matopo Hills, veld, general. Fl. and Fr. Sept., Oct. 15.

Distrib. British Central Africa, Rhodesia, South Africa.

An aromatic shrub of herbaceous habit, 1 m. high. Corolla white, with a purple spot at the base of each segment.

LIMNOPHILA SESSILIFLORA, *Blume.*

Matopo Hills, N.E. of Fort Usher, by and in streams. Fl. Oct. 212.

Distrib. Wide.

MELASMA SESSILIFLORUM, *Hiern.*

Victoria Falls, Knife Edge, in grass. Fl. Sept. 293.

Distrib. Angola, Mozambique District, Madagascar, South Africa.

RHAMPHICARPA TUBULOSA, *Benth.*

Victoria Falls, banks of islands. Fl. and Fr. Sept. 131, 101 bis.

Distrib. East Tropical Africa from Uganda to the Zambesi. South Africa.

Very conspicuous with its large pink flowers on the damp banks of islands and rocks in the Zambesi River above the Falls. The small-flowered white form (101) occurred in the Matopo Hills.

SOPUBIA SIMPLEX, *Hochst.*

Matopo Hills, by streams, general. Fl. Sept., Oct. 99.

Distrib. Tropical and South Africa.

LENTIBULARINEÆ. (Dr. Stapf.)

UTRICULARIA KIRKII, *Stapf.*

Victoria Falls, bog edge of Rain Forest and Livingstone Island abundant. Fl. Sept. 176.

Distrib. Batoka country. Zanzibar, Transvaal.

UTRICULARIA WELWITSCHII, *Oliver.*

Matopo Hills, vlei ground, near American Mission. Fl. Oct. 230.

Distrib. Angola, Kunene District, Nyassaland.

UTRICULARIA FIRMULA, *Welwitsch, ex Oliver.*

Victoria Falls, bog edge of Rain Forest and Livingstone Island, also in the Matopo Hills. Fl. Sept. 172.

Distrib. Tropical Africa.

UTRICULARIA GIBBSIÆ, *Stapf.*

Victoria Falls, bog edge of Rain Forest, Sept. 177.

Yellow flowers, with sensitive peduncle, twining round grass.

UTRICULARIA EXOLETA, *R. Br.*

Victoria Falls, Livingstone Island, and general in the Matopo Hills, Sept., Oct. 174.

Distrib. Throughout Africa, Asia, and Australia.

UTRICULARIA TRANSRUGOSA, *Stapf.*

Matopo Hills, general, vlei ground. Fl. and Fr. Sept. 50.

Distrib. Transvaal, Rhodesia.

GENLISEA AFRICANA, *Oliver.*

Matopo Hills, near American Mission, vlei ground. Fl. and Fr. Oct. 219.

Distrib. Angola, South Africa.

PEDALINEÆ.

CERATOTHECA TRILOBA, *E. Meyer.*

Matopo Hills, old Kaffir lands, general. Fl. Oct. 258.

Distrib. Tropical Africa, Betchuanaland, Transvaal, Natal.

SESAMUM BAUMII, *Stapf.*

Victoria Falls, on banks of islands, with *Phragmites.* Fl. Sept. 115.

Previously collected on the Zambesi (*Holub*, Herb. Kew.), and by Baum, Kunene-Zambesi Expedition.

PRETRÆA ZANGUEBARICA, *J. Gay.*

Matopo Hills, veld. Fl. Oct. 264.

Distrib. Kunene District, Zanzibar, South-east Africa.

A herbaceous perennial, sends out long shoots which lie flat on the ground, radiating from the root-stock, over a metre in length. The whole plant is of a grey colour, with pinkish-mauve flowers which stand above the foliage.

ACANTHACEÆ. (Mr. S. Moore.)

NELSONIA TOMENTOSA, *Willd.*

Victoria Falls, carpeting under Palms on the banks of river. Fl. Sept. 122.

Distrib. Tropical weed of Old World.

HYGROPHILA (§ Euhygrophila) **CATARACTÆ**, *S. Moore*, sp. nov.

H. caule ascendente, subsimplici, superne folioso, piloso-hispido deinde glabro; foliis mediocribus, lineari-oblanceolatis, acutiusculis, supra appresse strigosis mox fere glabris, subtus glabris; floribus in spica interrupta inferne leviter paniculata folia longe excedente digestis; nodis plurifloris; bracteis lineari-lanceolatis, ut bracteolæ lineares quam se ipsæ minores et calycis pentameri lobi anguste lineares vel lineari-lanceolati inter se valde inæquales hispidis necnon margine longiciliatis; corollæ tubo calyce breviore, cylindrico, labio antico amplo, ad $\frac{1}{3}$ lobato, transverse rugoso et intus piloso, postico anguste ovato-oblongo; filamentis exsertis; antheris inter se paullo inæqualibus; ovario pubescente; stylo subincluso; ovulis quove in loculo 7.—Ab *H. uliginosa*, S. Moore, et *H. Teuczii*, Lindau (hæc a me haud visa), abhorret ob indumentum, staturam minorem, calycis lobos inæquales, corollas parvas, &c.

Hab. Livingstone Island, Victoria Falls, overhanging the cataract. Sept. 159.

A plant about 0·5 m. high. Stem nodulose below, about 2 m. in diameter; leaves 2·5–6 cm. × 6–12 mm., very obtuse at the base, and almost amplexicaul; floral leaves gradually diminishing above, the youngest scarcely 1 cm. long; bracts ± 8 mm. in length; bracteoles linear, about 7 mm. long; calyx-lobes about 1 cm. long, the narrowest $\frac{1}{3}$ mm., the widest 1 mm. in width; tube of corolla 5 mm. long, 3–3$\frac{1}{2}$ mm. in diameter; upper lip 7 mm. long, its lobes oblong, very obtuse or emarginate, 2 mm. long; lower lip 8 mm. long, its lobes narrowly obovate, 3$\frac{1}{2}$ mm. long, the intermediate wider than the lateral; filaments puberulous, united in pairs below, the anticous broader than the posticous; anticous anthers 1$\frac{1}{4}$ mm., posticous 1 mm. long; ovary 2$\frac{1}{2}$ mm. long; style pilose-pubescent below, 8 mm. long. Capsule not seen.

HEMIGRAPHIS PRUNELLOIDES, *S. Moore*, sp. nov.

H. caule prostrato, radicante, ramulos simplices ascendentes graciles piloso-puberulos cito glabros emittente; foliis mediocribus, sessilibus, oblongo-lanceolatis, utrinque obtusis, margine sæpius undulato-crenulatis, glabris; floribus in spica interrupta folia longe excedente digestis; nodis plurifloris; bracteis lineari-oblanceolatis, obtusis, calyci æquilongis, quam bracteolæ paullo majoribus; calycis lobis anguste linearibus, obtusiusculis, ut bracteæ bracteolæque puberulis et margine ciliatis; corollæ extra puberulæ tubo calycem leviter excedente, infra medium subito coarctato, limbi lobis late obovatis, obtusissimis, tubum longitudine semiæquantibus; staminibus infra medium tubum insertis; ovario apicem versus pubescente; ovulis pro loculo 7; stylo ovario breviore; capsula circa 12-sperma.—Distat ab affini ***Hemig. tenera***, C. B. Clarke, foliis diversis, calyce majore, corollæ majoris lobis tubum semiæquantibus, staminibus tubo minus alte affixis, antheris minoribus.

Hab. Victoria Falls. Sept. 161.

Leaves 1·5–2·5 cm. long, 6–8 mm. broad, the floral ones usually 6–8 mm. long; bract 5 mm., bracteoles 4 mm. long, the former 1 mm. the latter $\frac{1}{3}$ mm. broad; lobes of calyx 5 mm. long; corolla-tube slightly more than 5 mm. long, at the bottom 1 mm., a little further up $\frac{2}{3}$ mm., at the throat $1\frac{1}{2}$ mm. wide; lobes scarcely 3 mm. long; anthers almost 1 mm. long; ovary nearly 2 mm., style $1\frac{1}{4}$ mm. long; capsule glabrous, 5 mm. long; the subrotund seeds 1 mm. in diameter.

One of the chief carpeting plants of the Rain Forest proper, occurring also on Livingstone Island and on exmerged rocks in the Zambesi River above the Falls.

DYSCHORISTE PERROTTETII, *O. Kuntze.*

Victoria Falls, Rain Forest, carpeting. Fl. Sept. 296.

Distrib. Upper Guinea and Nileland. Apparently the first record for South Central Africa.

DISPERMA VISCIDISSIMUM, *S. Moore*, sp. nov.

Suffrutex semimetralis, glanduloso-pubescens; caule ascendente, quadrangulari, cortice dilute brunneo obducto, superne ramulos breves foliosos patentes frequenter emittente; foliis subsessilibus, ovato-oblongis, obtuse acutis, basin versus sensim angustatis, margine crenulato-denticulatis, membranaceis; floribus pro rata majusculis, ex axillis superioribus ramulorum oriundis; bracteolis lineari-oblongis, obtusis, calyce brevioribus; calycis tubo cylindrico longitrorsum striato aliquanto decolori quam lobi lanceolati obtusiusculi multo longiore; corollæ extra puberulæ tubo calycem leviter excedente, cylindrico, fauces versus paullulum ampliato, limbo distincte bilabiato tubum semiæquante, lobis inter se subæqualibus (antico revera latiore) anguste oblongo-obovatis, obtusissimis emarginatisve, labio antico basi transverse rugoso intus decurvo-piloso; ovulis pro loculo 1; capsula brevi, calyce inclusa, polita, 2- vel abortu 1-sperma.—

Planta cum *Dispermate dentata*, C. B. Clarke, componenda, cujus indumentum dispar, calyx multo longius lobatus, &c.

Hab. Victoria Falls. Sept. 123.

Leaves usually 1-3 cm. long (rarely reaching 5 cm.) and 6 mm. to 1½ (seldom 2½) cm. broad, membranaceous, often grey-green when dry; bracteoles 7 mm. long; calyx 1·2 cm. long, with lobes only about 3 mm.; tube of corolla 1·2 cm. long, near the base 2 mm., further up 4 mm. in diameter; the lips 1 cm. long; lobes 8½ mm. long, 4–4½ mm. broad (the intermediate lobe of the lower lip 5 mm.); stamens shortly exserted; anthers oblong, obtuse at base, 2½ mm. long; ovary oblong-ovoid, 1½ mm. long; style puberulous, 1·2 cm. long; capsule obovoid, acute at the tip, 7 mm. long; seeds covered with appressed grey hygroscopic hairs, 3 mm. in diameter.

A strongly aromatic plant, growing in sand on veld. The young leaves and inflorescence are densely covered with glandular hairs.

PHAYLOPSIS LONGIFOLIA, *T. Thoms.*

Victoria Falls, Rain Forest, abundant. Fl. Sept. 160.

Distrib. Cameroons, Abyssinia, British and German East Africa, Natal, Cape Colony.

This plant occurs all through the Rain Forest, especially towards the back, and runs up to over a metre in height.

ASYSTASIA COROMANDELIANA, *Nees.*

Victoria Falls, banks of river and islands among reeds. Fl. Sept. 119.

Distrib. Common weed in Old World.

JUSTICIA ELEGANTULA, *S. Moore, in Journ. Bot.* xxxviii. (1900) p. 204.

Matopo Hills, veld. Fl. Sept., Oct. 32.

Distrib. Widely spread in Southern Rhodesia.

[A very interesting little herbaceous plant. It forms winter resting buds of fleshy white radical leaves on the rhizome below the surface; the cauline leaves succeeding these are small and linear, bearing rosy-pink flowers in their axils. From the base of these shoots, long surface runners are sent out, with large ovate leaves about 3 cm. long, and flowering shoots rise in the axils of these leaves. These secondary shoots apparently root at the nodes, when the fleshy radical leaves are laid down, forming water-storage tissue for next season's growth. It was the peculiarity of these secondary shoots with their very dissimilar leaves which led Mr. Moore, *loc. cit.*, to make his var. *repens*, S. Moore. His second var. *elatior*, S. Moore, was based on an unusually long primary shoot collected without the radical leaves. With incomplete material not showing the actual connections it would be impossible to make out the sequence of events.—L. S. G.]

DICLIPTERA MELLERI, *Rolfe.*

Matopo Hills, veld, general. Fl. Oct. 80.

Distrib. Nyassaland, Zambesi District, Rhodesia.

A herbaceous perennial, decumbent shoots, white flowers.

SELAGINEÆ.

HEBENSTREITIA HOLUBII, *Rolfe.*

Victoria Falls, islands. Fl. and Fr. Sept. 116.

Distrib. Zambesi District. Type from Sesheke, Zambesi (*Holub*, Herb. Kew.).

A glaucous herb, 1 m. high, with linear leaves and small white flowers.

WALAFRIDA CHONGWEENSIS, *Rolfe*, sp. nov.

Herba perennis, ramis strictis, minutissime puberulis; foliis linearibus subobtusis, laxis, interdum fasciculatis, subcanescentibus; spicis ad apices ramorum aggregatis, numerosis, subcorymbosis, multifloris; floribus brevissime pedicellatis, minutis; bracteis basi pedicellis adnatis, lineari-oblongis, obtusis, incurvatis, concavis; calyce trifido, lobis lateralibus oblongis, obtusis, parce ciliatis, lobo intermedio subulato, acuto, parce ciliato; corolla alba, tubo oblongo, lobis rutundato-oblongis, obtusis, inæqualibus; fructu ovoideo-globoso, tuberculato, in coccos 2 secedente.—Ad *W. angolensem*, Rolfe, accedit, differt foliis angustioribus, calycis lobis lateralibus latioribus.

Hab. Victoria Falls, banks of river and islands. *C. E. F. Allen*, 120 (Herb. Kew.), *L. S. Gibbs.* Sept. 117.

The plant is 6–7·5 dm. high; the leaves are 2–5 cm. long and 1–2 mm. broad; the separate spikes of the inflorescence are ± 3·6 cm. long; the bracts 2 mm. long; the calyx is 1 mm. long, the lateral lobes are 1 mm. long, and the intermediate one 0·5 mm. long; the tube of the corolla is 1·5 mm. and the lobes 1–1·5 mm. in length; the fruit is 1·3 mm. long.

" *Chongwe*," signifying the " Place of the Rains," was, according to Dr. Livingstone, the early native name of the Victoria Falls.

VERBENACEÆ.

DURANTA PLUMIERI, *Jacq.*

Matopo Hills, old Kaffir lands, by stream. Fl. and Fr. Oct. 280.

Distrib. Widely spread in Tropical and South-east Africa.

VITEX FLAVESCENS, *Rolfe*, var. nov. PARVIFLORA. A typo distat præcipue floribus minoribus et lacteis; calyce $5\frac{1}{2}$ mm. longo, hujus lobis 2 mm.; corollæ tubo 8 mm. longo, vix 3 mm. lato, cujus lobis 8 mm. longis; filamentis pubescentibus.

Hab. Victoria Falls, veld. Fl. Sept. 135.

This plant has been considered a synonym of *V. Mechowii*, Gürke, from which, among other points of difference, it is at once distinguished on account of its leaves being 3-foliate.

It is a shrub 1·5–2 m. high.

VITEX ISOTJENSIS, sp. nov.

Arbor, ramis glabris, junioribus flavo-pubescentibus; foliis longe petiolatis, 5-foliatis, foliolis breviter petiolulatis (petiolulis ut petioli flavo-pubescentibus) obovatis, basi obtusis vel cuneatis, rotundatis, obtusissimis vel etiam retusis, utrinque griseo-velutinis, nervis secundariis circa 9–10, supra planis subtus prominentibus; cymis folia subæquantibus, pedunculatis, ut bracteæ subulatæ dense flavo-pubescentibus; floribus parvis; calyce tubuloso infundibulari, obscure bilabiato, 5-dentato, 3 lobis anticis quam 2 posticis majoribus, extra flavo-pubescentibus; corolla breviter tubulosa, extra pubescente, tubo leviter incurvo quam calyx paullo longiore, lobis posticis lateralibusque brevibus, antico maximo, orbiculare, crenulato; staminibus styloque subinclusis.—Ab *V. Hildebrandtii*, Vatke, distat inter alia foliolis obovatis, apice rotundatis, bracteis flores non æquantibus, calyce breviori et obscure bilabiato.

Hab. Matopo Hills, top of Isotje, in cleft of granite. Fl. Oct. 236.

A tree 7 m. high.

The small cymes are from 3–5 cm. broad, the petioles ±6–7 cm. long and the petiolules ±1–2 mm. long; the three central leaflets are ±3·5 to 5·5 cm. long and ±2·6–4 cm. broad, the two lateral ±3 cm. long and 2·5 broad, but often very much smaller, the median and lateral veins are very pilose and stand out well in a dried state on the under surface; the small cymes are 3–5 cm.

across and 1·5 cm. long, the length of the peduncle in the flowering stage is from 3·5–5·5 cm. long, the bracts are ±6–7 mm. long; the calyx is ±3 mm. long and 3 mm. broad at the base of the lobes, the anterior calyx-lobes are ¾ mm. long and 1 mm. broad, the posterior ½ mm. long and ¾ mm. broad; the corolla is 7 mm. long to the end of the anterior lobe and the tube is exserted for about 2 mm.; the anthers and filaments are ±3 mm. long and the style and stigma 5 mm. long.

A small tree with spreading crown, densely covered with dark green pubescent leaves and small flat cymes of white flowers with mauve lip.

CLERODENDRON MYRICOIDES, *R. Br.*
Matopo Hills, old Kaffir lands. Fl. Oct. 282.
Distrib. Widely distributed in Tropical Africa, Natal.

LABIATÆ.

OCIMUM OBOVATUM, *E. Meyer.*
Matopo Hills, veld, general. Fl. Oct. 102.
Distrib. Upper Congo, German East Africa, South Africa.
A decumbent perennial; white flowers tinted mauve.

MOSCHOSMA RIPARIUM, *Hochst.*, forma.
Matopo Hills, veld and kopjes, common. ♂ ♀. Sept. 3.
Distrib. Angola, British Central Africa, Mozambique District, Transvaal, Natal.

A shrub, 1½–2 m., with rigid branches; usually flowers before the leaves, but in shady situations they were found simultaneous. The racemes are axillary only, and very much smaller than the type, especially the ♂.

PLECTRANTHUS FLORIBUNDUS, *N. E. Br.*
Matopo Hills, veld. Fl. Sept. 9.
Distrib. Swaziland, Natal.

Shrub, with cane-like branches, flowering before the leaves. The flowers are deep orange-yellow, borne in dense secund opposite racemes towards the apex of the leafless shoots. The var. *longipes*, N. E. Br., with laxer racemes, not secund, smaller and lighter yellow flowers, is rather widely distributed in South Tropical Africa, but this is apparently the first record for the type.

ILLECEBRACEÆ.

POLLICHIA CAMPESTRIS, *Ait.*
Victoria Falls, islands. Fl. Sept. 118.
Distrib. Tropical and South Africa.

AMARANTACEÆ.

ACHYRANTHES ASPERA, *Linn.*
Victoria Falls, Rain Forest and islands. Fl. and Fr. Sept. 171.
Distrib. Widely spread in the Tropics.

ALTERNANTHERA SESSILIS, *R. Br.*
Victoria Falls, banks of river, amongst reeds. Fl. Sept. 121.
Distrib. Widely distributed in the Tropics.

POLYGONACEÆ.

POLYGONUM HERNIARIOIDES, *Del.*
Matopo Hills, sand-banks in streams. Fl. Sept. 63.
Distrib. Angola, Amboland, Zambesi District, Rhodesia (*Gardiner*, Herb. Kew.).

PODOSTEMACEÆ. (Dr. Rendle.)

TRISTICHA TRIFARIA, *Tul.*
Victoria Falls, Livingstone Island. Fl. Sept. 320.
Distrib. Angola, Niger, Madagascar, Mascarenes.

This little plant was conspicuous by the bright green jungermanniaceous shoots, closely adpressed to the rock, in a shallow runnel where the water was rushing over the very edge of the cataract. The flat thallus encrusted the rock, bearing on it the little flowering shoots, not more than 2 cm. long.

T. ALTERNIFOLIA, *Tul.*
Victoria Falls, in river, on submer ed rocks and stones. Fl. and young Fr. Sept. 321.
Distrib. Niger, Congo, Nile, Central Africa.

This species was abundant, covering all the shallower rocks and stones, where there was no rush of water. The long red filamentous branches are very alga-like in appearance, floating freely.

SPHÆROTHYLAX sp.

Victoria Falls, river, thickly covering exmerged rocks. Fruiting capsules only, Sept. 322.

Distrib. South African genus.

[Dr. Rendle succeeded in identifying the genus of this plant under circumstances of some difficulty, as the material was quite dead when collected, with only the fruiting capsules. It is evidently the first to flower, as the dried vegetative remains, about 10 cm. high, densely covered all the exposed surface of the rocks with a seaweed-like growth, to be succeeded by the red floating branches and the flowers and fruit of *Tristicha alternifolia*, Tul., where the water had not yet gone down. Professor Farmer tells me this zonal distribution is characteristic of the family, and was always observed by him in Ceylon.—L. S. G.]

PROTEACEÆ.

PROTEA ABYSSINICA, *Willd.*

Matopo Hills, veld. Fl. and Fr. Sept., Oct. 59.

Distrib. Abyssinia, Rhodesia, Betchuanaland.

A handsome shrub, 3–6 m. high, evergreen, with light glaucous foliage, only the youngest leaves showing a silvery pubescence. Flower-heads large and white. This species is scattered in the Hills, but predominates on the "Sand veld" beyond Fort Usher, and I was told that this is the case wherever that particular formation occurs. Dr. Bolus (**11**. p. 11) in the South-eastern Region limits *Protea* chiefly to the Table Mountain Sandstone.

Popularly known as "sugar-bush," this plant is general throughout Southern Rhodesia (Salisbury, Herb. Kew.). I am indebted to Mr. Dowsett, of the Rhodes Matopo Park, for this material, having lost my own specimen.

FAUREA SALIGNA, *Harvey.*

Matopo Hills, veld. Fl. Oct. 313.

Distrib. Angola, Mozambique, Rhodesia. Also South-east Africa to Cape Colony (Knysna).

THYMELÆACEÆ.

LASIOSIPHON KRAUSSII, *Meissn.*

Matopo Hills, veld, general. Fl. Oct. 229.

Distrib. Angola, South Central Tropical Africa, and South Africa.

Loranthaceæ.

Loranthus Dregei, *Eckl. et Zeyh.*, forma subcuneifolia, *Engl. in Bot. Jahrb.* xx. (1894) p. 104 ex descript.

Matopo Hills, general. Fl. Oct. 181.

Distrib. Abyssinia, East Tropical Africa, Mozambique District, Transvaal, Natal.

A most striking plant, the leaves being so tomentose as to appear quite white. The flowers are also very pilose, with green petals and yellow hairy tube.

I could not determine the host plant.

Loranthus Kraussianus, *Meissn.*

Matopo Hills. Fl. Oct. 274.

Distrib. Natal.

A plant with smooth and shining leaves and tufts of brilliant orange-red flowers, growing on a tall tree, but I could not determine what species.

Loranthus (§ Tapinanthus) zambesicus, sp. nov.

L. ramulis novellis atque foliorum petiolis breviter pilosis; foliis oppositis vel sub-oppositis, ovatis obtusiusculis subcoriaceis, nervis lateralibus utrinque 4, patentibus, utrinque prominentibus; umbellis sessilibus, 5–7-floris; floribus sessilibus; bractea obliqua, pilosa, basi $\frac{1}{3}$ calyculum amplectente, ciliolata, calyculo breviter cupuliformi; ovario usque ad $\frac{3}{4}$ adnato piloso-ciliato; perigonii breviter pilosi tubo inferiore ovoideo, superiore elongato infundibuliformi, ultra medium unilateraliter fisso, laciniis lineari-lanceolatis, apice incrassatis; filamentis crassis, linearibus, in dentem brevem exeuntibus; stylo pentagono, superne incrassato, et infra stigma obovoideum attenuato.—Sp. *L. Schweinfurthii,* Engl., affinis, differt internodiis longioribus, umbellis et floribus sessilibus, bractea obliqua, perigonio superiore longiori.

Hab. Victoria Falls, parasitic on tree on banks of river. Fl. and Fr. Sept. 140.

The internodes are about 4·5 mm. long, the petioles 6 mm. long and slightly winged, the leaves are from 6–9·5 cm. long and 4·5–5·5 cm. broad; the bract is 2 mm. long and the calyculus 2 mm. long, the free edge surrounding the base of the lower perigonium being 1 mm. long; the lower perigonial tube is 5 mm. long and 4 mm. broad, and is followed by the upper one 3 cm. long and very attenuated at the base, the segments are 1 cm.

long and 2 mm. broad; the anthers are 4 mm. long, the tooth at the base of each being over 1 mm. long. The style and stigma are 3·4 cm. long. The fruit is ovoid, 3·4 cm. long and bearing the free edge of the calyculus on the apex. A member of the sub-section *Constrictiflori*. It was growing on a tree I did not know, which overhung the river-bank on the north side. The colouring is very brilliant red.

VISCUM VERRUCOSUM, *Harvey*.

Matopo Hills. Fl. and Fr. Sept. on *Croton gratissimus*, Burch. 16; on *Ficus* sp. 65.

Distrib. British Central Africa, Nyassaland, Transvaal, Natal.

This mistletoe is very general in the Hills. The above seemed to be the commonest hosts, and trees are often covered with it.

SANTALACEÆ.

COLPOON COMPRESSUM, *Berg*.

Matopo Hills, veld, general. Fl. Oct. 183.

Distrib. South Africa.

EUPHORBIACEÆ.

EUPHORBIA MATABELENSIS, *Pax, in Ann. Hofmus. Wien*, xv. (1900) p. 51.

Matopo Hills, veld and kopjes, very general. Fl. Sept. 24.

Distrib. Rhodesia.

A spinously branched shrub, 2–3 m., with smooth grey bark; flowers yellow on old wood, before the leaves. This species seems to be nearer *E. cuneata*, Vahl, than *E. Gürichiana*, Pax, which Pax has given as the affinity.

EUPHORBIA BENGUELLENSIS, *Pax, in Bull. Herb. Boiss.* vi. (1898) p. 741.

Matopo Hills, veld. Fl. Oct. 234.

Distrib. Angola, Huilla, Kunene District.

A little herbaceous perennial, flowering in tufts, at about 10 cm. high. The flowers are white, with fimbriated white glands. Apparently the first record for Rhodesia.

PSEUDOLACHNOSTYLIS, sp. aff. MAPROUNEÆFOLIÆ, *Pax, in Bot. Jahrb*, xxviii. (1899) p. 20.

Matopo Hills, veld, general. ♂. Oct. 276.

Distrib. German East Africa, Kunene District.

A small tree, with straight trunk and spreading crown. The young foliage is glabrous, and delicate green in colour; the ♂ yellow-green, occurring in little racemes from the nodes of the old wood, towards the ends of the branches. In the ♀ (which I did not see) the flowers are single, in the axils of the leaves, on the young wood. I am indebted to Dr. Stapf for the identification of this plant, which is an interesting record. Pax's new genus was only described in the above paper, and the two species on which it is based have been collected, one in East Tropical Africa, and the other, *Pseudolachnostylis maprouneæfolia*, Pax, in German East and Portuguese South-west Africa. My specimen is probably a new species, as it does not quite agree with *P. maprouneæfolia*, Pax, ex descript., but with only ♂ and very young leaves it is impossible to decide the question definitely.

PHYLLANTHUS RETICULATUS, *Poir.*

Victoria Falls, Rain Forest, islands and banks of river. Fl. and Fr. Sept. 129.

Distrib. Wide in Tropical Africa and Asia.

PHYLLANTHUS NIRURI, *Linn.*

Matopo Hills, Kaffir lands, general. Fl. Oct. 314.

Distrib. Widely distributed in the Tropics, also in South Africa.

CROTON GRATISSIMUS, *Burch.*

Matopo Hills, kopjes. Oct. 209.

Distrib. Amboland and in South Africa.

Shrub, 2–3 m. high, aromatic. This plant shows drought condition during the dry season. The leaves fold up and the young racemes with small buds, which are evidently developed during the rains, look quite dead. Before I left at the end of October, I saw several bushes quite revived and in flower.

CROTON (§ Eucroton) BAROTSENSIS, sp. nov.

Arbor, ramulis juvenilibus tomentoso-stellatis; foliis ovatis, basi obtusis, apice acutis, inæqualiter serratis, penninerviis, petiolatis, petiolo lamina 3plo breviori limbo basi stipitato biglanduloso; stipulis setaceis caducis; racemis elongatis, basi interruptis; floribus racemosis pedicellatis; bracteis subulatis setaceis; sepalis ♂ 5 ovalis lanceolatis obtusis stellato-pilosis, sparse lepidotis; petalis oblongis subobtusis extra lepidotis pilosis; staminibus 18, filamentis lanatis; receptaculo piloso; ♀ sepalis lanceolatis, subacutis, dense pilosis lepidotis; petalis nullis; ovario squamuloso tomentello; stylo semel dichotome diviso.

Sp. *Crotoni macrostachidi*, A. Rich., affinis, differt petiolo et racemis brevioribus, bracteis unifloribus et staminibus 18.

Hab. Victoria Falls, islands and banks of river. Fl. Sept. 109.

A tree about 9 m. high, the leaves densely pubescent with a greyish stellate tomentum sparsely lepidote; the leaves are 9 cm. long and ±6 cm. broad, elongated at the apex; the petiole is 2 cm. long, densely tomentose, and the very caducous stipules are 5 mm. long; the raceme is 14 cm. long; the ♀ flowers are at the base of the spike, almost sessile; the pedicels of the ♂ are 3 mm. long; the bracts are 5 mm. long; the sepals of the ♂ are over 4 mm. long (in both sepals and petals the veins are brown) and 1½ mm. broad; the petals are 5 mm. long and 1 mm. broad; filaments 6 mm. long and anthers 1 mm. long; the sepals of the ♀ are 3½ mm. long and 1 mm. broad, the ovary is 4 mm. long, and the dichotomous style 4 mm. long.

ACALYPHA PEDUNCULARIS, *Meissn.*

Matopo Hills, veld, general. Fl. Oct. 227.

Distrib. Kunene District, Rhodesia, South Africa.

A herbaceous perennial, flowering at about 20 cm. high. A typical veld plant, sending up single erect shoots.

ACALYPHA ZAMBESICA, *Muell. Arg.*

Matopo Hills, veld, general. Fl. Oct. 225.

Distrib. South Zambesi District. British Central Africa, Nyassaland and Mozambique District, Rhodesia.

An erect, much-branched, herbaceous perennial, not ·5 m. high. Rather striking owing to the long red stigmas of the ♀ spikes.

URTICACEÆ.

FICUS SONDERI, *Miq.*

Matopo Hills, kopjes, general. Fr. Oct. 26.

Distrib. Rhodesia (*Baines*, Herb. Kew.), Transvaal, Natal.

A large tree, with spreading crown; young branches and leaves very hairy, deciduous. The bracts are conspicuous, being red, very pilose and caducous. The fruit is edible.

FICUS LUTEA, *Vahl.*

Matopo Hills, veld and kopjes, general. Fr. Oct. 285.

Distrib. Tropical and South Africa.

Large tree, the roots flatten over rocks and are often over a metre broad. The old leaves are thrown off just before the young foliage appears, which is red in colour.

SALICINEÆ.

SALIX CAPENSIS, *Thunb.*

Matopo Hills, banks of Malami River. ♂ ♀. Sept. 21.

Distrib. Transvaal, Cape Colony.

I have not found this species recorded for Tropical Africa.

HYDROCHARIDEÆ.

HYDRILLA VERTICILLATA, *Royle.*

Victoria Falls, in Zambesi, abundant. Sept. 136.

Distrib. Cosmopolitan.

=2374 Wilms. Greytowr, Natal (Herb. Kew.). A pondweed, forming dense masses floating on the river. Dark green. Kindly identified for me by Mr. Rolfe.

ORCHIDEÆ.

LISSOCHILUS KREBSII, *Reichb. f.*

Matopo Hills, veld, among trees. Fl. Oct. 254.

Distrib. Lake District and Uganda, Portuguese East Africa, Rhodesia, South-east Africa.

Flowering before the leaves.

ANSELLIA AFRICANA, *Lindl.*

Matopo Hills, general. Fl. Sept., Oct. 270.

Distrib. West to East Tropical Africa, Rhodesia, Transvaal.

An epiphytic species, with ascending aerial roots.

IRIDEÆ.

HESPERANTHA MATOPENSIS, sp. nov.

H. bulbo globoso, tunicis pluribus brunneis laciniatis obducto; foliis basalibus 2–3, anguste linearibus glabris, caulinis 3, basi vaginantibus, superne autem liberis summo ad meram vaginam reducto; scapo folia superante, simplice, 5–8-floro, spicam distícham laxam suffulciente; spathæ valvis inter se subæqualibus oblongis, apice acutis vel obtusiusculis, hyalinis membranaceis; perianthii tubo longissimo arcuato, anguste cylindraceo, apicem versus paullulum ampliato; segmentis oblongis, apice obtusis, tubo paullo brevioribus; antheris filamentis æquilongis; styli ramis columna brevioribus.—Ab affini *Hesp. Tysoni*, Baker, distat ob tubum arcuatum spatha duplo longiorem, segmenta longiora necnon brunnea, et antheras a segmentis superatas.

Hab. Matopo Hills, sandy banks of Malami River. Sept. 44.

The corm is from 12–15 cm. long, 14–18 cm. in diameter. The base of the brown outer scale-leaf separates from the upper portion as the young corms break through, on growing out at the base of the old corm, thus leaving a free basal scale with laciniate margin and an upper enveloping portion of the scale-leaf, also with laciniate margin. The basal leaves vary from 16–26 cm. long and 2 mm. broad. The stem is from ·5–·9 m. high, including the lax spike. The spathe-valves are of equal length, 2 cm. long and 6 mm. broad at the base, the spathes of the upper flowers being more obtuse than those subtending the lower. The perianth-tube is about 2 cm. long and 1 mm. broad, the segments are about 1·6 cm. long and 4 mm. broad, the inner series rather narrower; the stamens are inserted at the mouth of the tube, the filaments being 8 mm. long and the anthers the same length and 1 mm. broad; the style arms are 1·5 cm. long and the column 2·2 cm. long.

A very distinct species, with corolla and spathe of the palest brown, the long tubes being very curved, and the perianth-segments reflexed, exposing the stamens. The flowers are sweet-scented, opening in the evening. I only saw it in one locality, but there it was abundant.

GLADIOLUS MELLERI, *Baker.*

Matopo Hills, vlei ground, general. Fl. Oct. 202.

Distrib. Portuguese East and British Central Africa, Rhodesia.

This species flowers before the leaves, but the last season's foliage is often found still attached to the bulbs, as in the above specimen.

GLADIOLUS PRIMULINUS, *Baker.*

Victoria Falls, Knife Edge. Sept. 323.

Distrib. South-east Africa, Usagara Mountains. The corm only of this specimen was brought back. It flowered at the Chelsea Physic Garden in June 1906.

AMARYLLIDACEÆ.

HYPOXIS VILLOSA, *Linn.*

Matopo Hills, veld, general. Fl. Oct. 192.

Distrib. Tropical and South Africa.

The clear yellow flowers of this plant are striking, as it is very common, and one of the first to come up after the veld has been burnt. It blooms very freely, sending up the flower-stalks before the leaves. In the specimen the dry leaves are of last season's growth.

BUPHANE DISTICHA, *Herbert.*

Matopo Hills, veld, general. Fl. Oct. 208.

Distrib. Angola, Mozambique district, South Africa.

Large bulbs which send up cushion-like umbels of magenta flowers, about 2 m. high, before the leaves, sweet-scented.

LILIACEÆ.

ASPARAGUS LARICINUS, *Burch.*

Matopo Hills, near streams, general. Sept. 18.

Distrib. Rhodesia, Betchuanaland, Orange River, and Cape Colony.

A handsome species, which sends up erect canes over 2 m. high, with very white stem and whorled cladodes.

ALBUCA CAUDATA, *Jacq.*

Matopo Hills, veld, common. Fl. and bulb, Oct. 287.

Distrib. Portuguese East Africa, Nyassaland, Rhodesia, and South Africa.

Flowering before the leaves; flowers brown-pink in colour.

URGINEA SANGUINEA, *Schinz, in Verhandl. Bot. Vereins Branden.* xxxi. (1890) p. 219.

Victoria Falls, veld, common. Fl. and Fr. Sept. 147.

Distrib. Amboland.

Flowers before the leaves.

SCILLA LANCEÆFOLIA, *Baker.*

Matopo Hills, veld. Fl. Oct. 191.

Distrib. Angola, Uganda, Zambesi District, South Africa.

XYRIDEÆ.

XYRIS MULTICAULIS, *N. E. Br.*

Victoria Falls, bog edge of Rain Forest and Livingstone Island. Fl. Sept. 169.

Distrib. British Central Africa, Nyassaland.

XYRIS CAPENSIS, *Thunb.*

Matopo Hills, vlei ground, general. Fl. Sept. 85.

Distrib. Tropical and South Africa.

COMMELINACEÆ. (Mr. C. B. Clarke.)

COMMELINA NUDIFLORA, *Linn.*

Victoria Falls, banks of islands and river, amongst reeds. Fl. Sept. 120.

Distrib. Cosmopolitan.

FLOSCOPA GLOMERATA, *Hassk.*

Victoria Falls, bog edge of Rain Forest, Livingstone Island, and exmerged rocks in river. Fl. Sept. 297.

Distrib. Angola, British Central Africa, Zambesi District, South-east Africa, and Madagascar.

A small creeping perennial with purple flowers.

JUNCACEÆ. (Mr. C. B. Clarke.)

JUNCUS FONTANESII, *Laharpe.*

Matopo Hills, sand-banks in streams. Fl. and Fr. Sept. 57.

Distrib. Algeria, Abyssinia, Masai Highlands, Southern Europe, and Asia.

NAIADACEÆ.

POTAMOGETON NATANS, *Linn.*

Matopo Hills, streams, general. Fl. Sept. 94; also at Victoria Falls, in Zambesi River, common. Fl. Sept. 146.

Distrib. Cosmopolitan.

Mr. Arthur Bennett, to whom I submitted the above specimens, writes:—"There is no doubt both are *P. natans*, Linn. 146 is much like some *fluitans* forms, but the last leaf it is producing decides for *natans*. There is no record for Tropical Africa, and it is very interesting. The nearest station I hear of is 'Sources of the Limpopo, *Nelson*.'"

POTAMOGETON PUSILLUS, *Linn.*

Matopo Hills, in streams. Fl. and Fr. Sept. 190.

Distrib. Cosmopolitan.

ERIOCAULACEÆ. (Dr. Rendle.)

ERIOCAULON SUBULATUM, *N. E. Br.*

Victoria Falls, bog edge of Rain Forest, Knife Edge, and Livingstone Island. Fl. Sept. 175.

Distrib. British Central Africa.

A very abundant little species, varying from about 3 to 8 cm. in height. First collected by Sir John Kirk in the same locality.

ERIOCAULON AMPHIBIUM, *Rendle*, sp. nov.

Herba acaulescens foliis rosulatis, linearibus superne angustatis, apice leviter incrassatis, glabris, multinervis, tesselatim venulosis; pedunculo solitario, tenue, longitudinaliter striato, glabro, vagina laxa, tubuliforme, apice breviter et unilateraliter fissa, folia excedente, glabra; capitulo globoso, niveo, bisexuale; bracteis involucralibus reflexis, pallide brunneis, late oblongis et obtusis, interioribus oblongo-spathulatis, et breviter acuminatis, bracteis fertilibus paullo brevioribus, spathulatis, abrupte acuminatis, superne brunneis, dorso sub apice albo-barbatis; receptaculo sparse villoso; floribus fœmineis breviter pedicellatis, sepalis 3, connatis, tubo infundibuliforme lateraliter fisso, superne concavo et fusco, apice dorsaliter albo-barbato; petalis 3 subæqualibus, obovato-spathulatis, in facie interiore dense lanatis sub apice glanduligeris, apice barbatis: ovario trigono, stylo pæne ad basin tripartito; floribus masculis cum sepalis ut in fl. fœmineo; stipite supra sepala breve; petalis albis, subæqualibus, oblongis, glanduligeris, lanatis et barbatis ut in fl. fœmineo; staminibus 6, antheris olivaceis; seminibus flavidis translucentibus.

Plants growing alongside the stream and also submerged; attached by long stout cylindrical roots, 2 mm. thick. Leaves reaching nearly 8 cm. long, 7 mm. broad above the sheath; peduncle 30–40 cm. long, about 1 mm. diam. in the middle; heads 6 mm. diam.; involucral bracts about 3 mm. long, fertile bracts about 2·5 mm. long; outer rows of female flowers, remainder of head male; female flower—sepals 2·5 mm. long, stipe below petals 5 mm., petals about 2·5 mm. long and 1 mm. broad; style divided for nearly $\frac{3}{4}$ its length; male flower—stipe below petals barely 1 mm. long, petals 2 mm. long by barely 1 mm. broad.

Hab. By and in stream, Matopo Hills, near American Mission.

An interesting species recalling *E. lacteum*, Rendle, in habit, but differing from all other African species in having the sepals of the female, as well as of the male, flower connate.

ERIOCAULON MATOPENSE, *Rendle*, sp. nov.

Herba acaulescens foliis densiter rosulatis, brevibus, subulatis,

apice parum incrassatis, glabris, basi autem dense lanata; pedunculis pluribus, tenuibus, cylindricis, 7-costatis, tortis, glabris, erectis, folia multoties excedentibus, vaginis quam foliis longioribus, apice bifidis et supra medium unilateraliter fissis, glabris; capitulis depresso-globosis, bisexualibus, albido-brunneis; bracteis involucralibus appressis, obovato-oblongis, apice rotundatis bracteis fertilibus obovato-spathulatis, valde concavis, breviter acutis, dorso sub apice albo-barbatis; receptaculo piloso; floribus fœmineis subsessilibus, sepalis 3, subclavatis, 2 oppositis scaphoideis, tertio paullo breviore et complanato, dorso supra medium albo barbatis; petalis 3, subæqualibus, lineari-spathulatis, sub apice glanduligeris, dorso supra medium barbatis, ovario trigono, stylo alte trifido; fl. masculis breviter pedicellatis, sepalis 3, liberis, inæqualibus, lineari-subulatis ad oblongo-spathulatis, dorso sub apice barbatis; petalis valde inæqualibus, uno parvo, oblongo, dense barbato, alteris pæne obsoletis, staminibus 6, antheris atris.

Plants 15–20 cm. high. Leaves 2–3 cm. long, about 2 mm. broad just above the sheathing base; peduncle 15–20 cm. long, less than 1 mm. diameter, solid in section, sheaths about 3·5 cm. long; heads about 5 cm. diameter; involucral bracts closely appressed to the base of the head, barely 3 mm. long and 1·5 mm. broad, fertile bracts slightly shorter; female flowers on the outside of the head, sepals 2 mm. long, petals about 2 mm. long and 5 mm. broad, the odd one rather longer and broader, style branched for about $\frac{2}{3}$ its length; male flower—sepals about 1·5 mm. long, 3 to 5 mm. broad, stipes between sepals and petals barely 1 mm. long, two of the petals reduced to inconspicuous blunt outgrowths behind two alternate stamens, the third about half the length of the stamen; filaments of stamens about 1 mm. long.

Hab. Matopo Hills, bog near the "View."

Near the South Tropical African *Eriocaulon lacteum*, but a smaller plant with narrower leaves and without the sharp points to the bracts.

PÆPALANTHUS WAHLBERGII, *Koern.*

Matopo Hills, bog near the "View." Fl. Sept. 86.

Distrib. Nigeria, German East Africa, Angola, Transvaal.

This is the first record for Rhodesia.

CYPERACEÆ. (Mr. C. B. Clarke.)

PYCREUS MUNDTII, *Nees.*

Victoria Falls, bog edge of Rain Forest. Fl. and Fr. Sept. 149.

Distrib. Tropical and South Africa, Madagascar.

Forms dense growth, sending out long stolons over a metre in length.

CYPERUS HASPAN, *Linn.*, var. β. AMERICANA, *Boeck.*

Victoria Falls, on bog edge and in Rain Forest, on islands. Fl. and Fr. Sept. 167.

Distrib. Cosmopolitan.

CYPERUS DENUDATUS, *Linn. f.*

Matopo Hills, sand-banks in streams. Fl. and Fr. Sept. 56.

Distrib. Tropical and South Africa, Madagascar.

ELEOCHARIS CAPITATA, *R. Br.*

Victoria Falls, bog edge and in Rain Forest. Fl. and Fr. Sept. 162.

Distrib. Senegal, Congo, Abyssinia, Asia, Polynesia, America.

Grows densely, forming large part of undergrowth.

SCIRPUS FLUITANS, *Linn.*

Matopo Hills in streams. Fl. and Fr. Sept. 211.

Distrib. Cosmopolitan.

SCIRPUS SUPINUS, *Linn.*

Matopo Hills, sand-banks in streams. Fl. and Fr. Sept. 58.

Distrib. Cosmopolitan.

SCIRPUS PALUDICOLA, *Kunth.*

Victoria Falls, Rain Forest, and Livingstone Island. Fl. and Fr. Sept. 168.

Distrib. Orange River, Cape Colony, Natal, Madagascar.

FUIRENA STRICTA, *Steud.*

Matopo Hills, by stream, near the "View." Fl. and Fr. Sept. 92.

Distrib. Upper Guinea, British East and Central Africa, Madagascar, and Comoro Islands.

FUIRENA SUBDIGITATA, *C. B. Clarke*, sp. nov.

Fere glabra, spiculis 1–4 terminalibus, subcapitatis; glumarum aristis nec ciliatis nec recurvatis, petalis (*i. e.* setis hypognis 3 interioribus) cum ½ parte nucis subæquilongis, setuliformibus recurvato-scabris, aut fere nullis; nuce nigra, longitudinaliter striata, cellulis ellipticis pallidis transversis, in seriebus verticaliter superpositis.

Hab. Matopo Hills, sand-banks, Malami River. Sept. 196.

Rhizome woody, horizontal; culms approximate, 3–4 dm. long, nodes in the upper parts of the culms fewer; the spicules are 2 cm. long and 4 mm. in diam.; the leaves are narrow and erect; the glumes minutely pubescent; the nut is shortly stipitate; the rostrum conical, white and setulose.

This species is near *Fuirena glomerata*, Bojer.

[Mr. Clarke notes that "Several African Fuirenas are close to this, and these are considered but one species by some authors; No. 196 therefore does not make a strong species, but I can find nothing that quite matches it."—L. S. G.]

FUIRENA ŒDIPUS, *C. B. Clarke*, sp. nov.

F. rhizomate horizontali; culmi nodo imo tumido, ellipsoideo, albo; petalis (*i. e.* setis hypogynis 3 interioribus) obovatis, 3 nervis cum nuce æquilongis; nuce levi, rostro lineari-cylindrico levi.

Hab. Victoria Falls, bog edge of Rain Forest. Sept. 125.

The pseudo-bulbs are sessile, distant, on the horizontal rhizome, 12 mm. long and 7 mm. in diam., with contracted base; culms 4 dm. long, rather thick, almost glabrous, heads 3–4, 6–8-branched, culms distant; spikes 5 mm. long, fuscous nigrescent, ciliate-pilose.

This species is near *F. umbellata*, Rottb.

FUIRENA sp.

Matopo Hills, in sedge by streams. Sept. 54.

The rhizome resembles that of *F. pubescens*; but without a nut, this is only a guess.

GRAMINEÆ.

ERIANTHUS TERETIFOLIUS, *Stapf*, sp. nov.

Affinis *E. junceo*, Stapf, sed panicula majore argenteo-villosa, articulis pedicellisque scaberulis cæterum glabris, spiculis pilis albis superatis, glumis valvisque angustioribus, arista longiore diversa.

Gramen ad 2–3 m. altum. *Folia* basalia dense congesta;

vaginæ arctæ imbricatæ, crassæ, firmæ, teretes, glaberrimæ, pallidæ, albidæ; ligulæ late ovatæ vel oblongæ, 2–4 mm. longæ, scariosæ in dorso pilosæ; laminæ teretes, basin versus leviter canaliculatæ, ultro 1 m. longæ ad 5 mm. crassæ, albescentes, lævissimæ, glabræ nisi basi pone ligulam pilosæ, in vaginæ dorsum decurrentes. *Panicula* angusta, erecta, argenteo-villosa, circiter 6 dm. longa, 1 dm. lata; rhachis lævis, teres vel superne angulata, supra nodos canaliculata; rami primarii ad 15 cm. longi, a basi laxe ramulosi, graciles; ramuli filiformes, tenaces; articuli 3–5 mm. longi; pedicelli germinati, unus articulum suum subæquans, alter dimidio brevior, glabri, scaberuli. *Spiculæ* lanceolatæ, albæ, 5 mm. longæ. *Callus* brevis, dense pilosus, pilis 1 mm. longis. *Gluma inferior* anguste oblonga, apice 2-dentata, sub-2-carinata tenuis, nervis intracarinalibus 2, extracarinalibus utrinque 1, dorso infra medium longe pilosa, pilis ad 6 mm. longis; *superior* inferiori æquilonga, lanceolata, acuta, 3-nervis, tenuis dorso imprimis infra medium longe pilosa. *Anthœcium inferum* ad valvam vacuam 2-nervem angustam in margine ciliatam reductum. *Anthœcium superum* hermaphroditum; valva anguste lineari-lanceolata, hyalina, 2-loba, ad 2 mm. longa, lobis angustis, marginibus ciliatis, arista tenui columna 1 mm. longa, seta circa 7 mm. longa leviter torta; palea minuta, elliptica, hyalina. *Lodiculæ* cuneatæ. *Antheræ* purpureæ, 3 mm. longæ. *Stigmata* fere 3 mm. longa, saturate purpurea.

Victoria Falls, banks of river and islands. Fl. and Fr. Sept. 141.

A handsome grass, 2–3 m. in height, with long rush-like leaves, which are used by the natives for plaiting mats. (*O. Stapf.*)

POLLINIA VILLOSA, *Spreng.*
Victoria Falls, bog edge of Rain Forest. Fl. Sept. 153.
Distrib. German East Africa, Cape Colony, Madagascar.

ANDROPOGON EUCOMUS, *Nees.*
Matopo Hills, in sedge by streams. Fl. and Fr. Sept. 23.
Distrib. Tropical and South Africa.

A. HIRTUS, *Linn.*
Matopo Hills, near streams. Fl. Oct. 288.
Distrib. Wide in Tropical and South Africa.

Oplismenus sp.

Victoria Falls, Rain Forest and islands. Sept. 158.

No flower or fruit. One of the chief carpeting plants in the Rain Forest.

Polypodiaceæ. (Mr. J. G. Baker.)

Cyathea Dregei, *Kunze.*

Matopo Hills, near American Mission, by streams. Oct. 292.

Distrib. Nileland, British Central Africa, Nyassaland, Zambesi District, South Africa.

Adiantum caudatum, *Linn.*

Victoria Falls, Rain Forest and kloofs of lower gorge. Sept. 180; also Matopo Hills, Mtchabesi Valley. 316.

Distrib. East Tropical Africa and Transvaal.

Adiantum Capillus-Veneris, *Linn.*

Matopo Hills, Malami River. Sept. 20; also at Victoria Falls, Rain Forest, and Livingstone Island.

Distrib. Cosmopolitan.

Adiantum Oatesii, *Baker, in Oates, Matabeleland,* ed. 1, App. p. 369.

Victoria Falls, Rain Forest, bordering stream. Sept. 317. (Only dead fronds.)

Distrib. Zambesi District, Ngamiland, Crocodile River.

Cheilanthes hirta, *Swartz.*

Matopo Hills, kopjes, general. Sept. 90.

Distrib. Angola, Mascarenes, and South Africa.

This species was only seen in the drought condition of the dry season, the pinnæ rolling up to the rachis. It soaks out in water.

Cheilanthes multifida, *Swartz.*

Matopo Hills, under overhanging rocks. Sept. 69.

Distrib. Tropical Africa, Natal, Cape Colony.

Cheilanthes farinosa, *Kaulf.*

Victoria Falls, Rain Forest, and Knife Edge. Sept. 6.

Distrib. Tropics of Old and New World.

Pellæa geraniæfolia, *Fée.*

Matopo Hills, kopjes. Sept. 291.

Distrib. Zambesi District, Angola, South-east Africa, and Mascarenes, Tropics of Old and New World.

Collected in drought condition.

PELLÆA PECTINIFORMIS, *Baker.*

Matopo Hills, near American Mission, by stream. Oct. 294.

Distrib. Angola, Mascarenes, Transvaal, Natal.

PELLÆA HASTATA, *Link.*

Metopo Hills, kopjes, general. Sept. 89.

Distrib. Abyssinia, Zambesi District, Mascarenes, South Africa.

PTERIS QUADRIAURITA, *Retz.*, var.

Matopo Hills, by streams, general, and at Victoria Falls, Rain Forest, Knife Edge, and kloofs. Oct. 223.

Distrib. Throughout the Tropics, Transvaal, Natal.

ASPLENIUM FURCATUM, *Thunb.*

Matopo Hills, kopjes, general. Sept. 28.

Distrib. Tropics of Old and New World, South Africa.

Collected in drought condition.

ACTINIOPTERIS RADIATA, *Link.*

Matopo Hills, kopjes, general; also at Victoria Falls, veld. Sept. 33.

Distrib. Throughout Africa to Transvaal, Asia.

NEPHRODIUM ALBO-PUNCTATUM, *Desv.*

Matopo Hills, Mtchabesi Valley. Oct. 210.

Distrib. Tropical Africa and islands, Natal.

Collected in drought condition. No sori: this is therefore a tentative determination.

NEPHRODIUM UNITUM, *R. Br.*

Victoria Falls, banks of river and of islands, running through *Phragmites.* Sept. 151.

Distrib. Tropics of Old and New World, Cape Colony, Natal.

NEPHROLEPIS CORDIFOLIA, *Presl.*

Victoria Falls, Rain Forest, and Knife Edge, running up trunks of trees. Sept. 155.

Distrib. Tropics of Old and New World.

Only the dead fronds, on rhizome. No sori.

NEPHROLEPIS EXALTATA, *Schott.*

Victoria Falls, Rain Forest. Sept. 148.

Distrib. Angola, Upper Guinea, Zambesi District, Crocodile River; also Tropical Asia, Australia, and America.

NOTHOLÆNA BUCHANANI, *Baker.*

Matopo Hills, under overhanging rocks, near the "View." Sept. 70.

Distrib. Nyassaland, Natal.

GYMNOGRAMME CORDATA, *Schlecht.*

Matopo Hills, kopjes, scattered. Sept. 29.

Distrib. Angola, South Africa, Bourbon, and St. Helena.

Only seen in the drought condition, the rhachis curling up in this species, exposing the dorsal surfaces of the pinnæ, which are thickly covered with membranous scales.

SCHIZÆACEÆ. (Mr. J. G. Baker.)

MOHRIA CAFFRORUM, *Desv.*

Matopo Hills, Isotje. Oct. 235.

Distrib. Angola, Tropical Equatorial East Africa, Mascarenes, South Africa.

LYCOPODIACEÆ. (Mr. J. G. Baker.)

LYCOPODIUM CAROLINIANUM, *Linn.*

Matopo Hills, vlei ground, American Mission. Oct. Fr. 231.

Distrib. Central and South Africa, Madagascar and Mascarenes, America, Asia, Australia.

SELAGINELLACEÆ. (Mr. J. G. Baker.)

SELAGINELLA RUPESTRIS, *Spring.*

Matopo Hills, kopjes, general. Sept. 4.

Distrib. Abyssinia, German East Africa, South-east Africa; also wide in temperate regions.

Only seen in drought condition, when it forms dense white patches covering shallow pans and crevices in granite. On soaking in water the leaves spread out, showing the green laminæ and the sporophores with mature spores, which are shed on commencement of rains. The white colour in the drought condition is due to the long hair-points of the adpressed leaves.

SELAGINELLA IMBRICATA, *Spring.*

Victoria Falls, on the top of and lower down the cliffs of the lower gorge of the Zambesi River. Sept. 179.

Distrib. Cameroons, Abyssinia, Zambesi District, and Arabia.

Forms dense carpeting masses on the edge of the plateau. In drought condition the whole frond is tightly curled up, exposing the light under surface of the pinnæ.

MARSILEACEÆ. (Mr. J. G. Baker.)

MARSILEA CAPENSIS, *A. Br.*

Matopo Hills, Malami River. Fr. Oct. 289.

Distrib. Rhodesia, South Africa.

MARCHANTIACEÆ.

PLAGIOCHASMA sp. (?).

Matopo Hills, bordering streams, general. Fr. Oct. 324.

This plant is now growing vigorously in the Chelsea Physic Gardens.

RICCIACEÆ.

RICCIA FLUITANS, *Linn.*

Matopo Hills, in streams. Sept. 318.

Distrib. Cosmopolitan.

FUNGI. (Miss Lorrain Smith.)

HYMENOCHÆTE RUBIGINOSA, *Sev.*

Victoria Falls, veld, on dead wood. Sept. 262.

Distrib. Cosmopolitan.

POLYSTICTUS SANGUINEUS, *Meyer.*

Victoria Falls, veld, on dead wood. Sept. 165.

Distrib. Wide in the Tropics.

CHARACEÆ. (Mr. Henry Groves.)

NITELLA HYALINA, *Ag.*

Matopo Hills, Malami River. Fr. Sept. 311.

Distrib. Cosmopolitan, but very local.

Growing in dense patches, about 3 cm. high, where the water runs over stones.

NOSTOCACEÆ. (Mr. Wm. West.)

NOSTOC COMMUNE, *Vaucher*.

Victoria Falls, bog edge of Rain Forest and Livingstone Island, abundant. Sept. 200.

Distrib. Cosmopolitan.

In round green gelatinous balls, varying in size from that of a marble to a cricket-ball. On cutting open, these balls show a white matrix. A very polymorphic species, which occurs in almost every latitude.

PLANT ASSOCIATION AT THE VICTORIA FALLS.

In considering the surroundings of the Victoria Falls from a botanical point of view, three distinct regions may be recognized, due rather to edaphic than geological conditions.

The first is the Veld, or open Forest growth, which obtains through the whole of Southern Rhodesia, extending as far as eye can see on both sides of the Zambesi River.

The second region seems to be limited to the immediate banks of the Zambesi River and islands above the Victoria Falls, in which the dominant plant is *Eugenia guineensis*.

The third would include the bog edge of Livingstone Island and that of the opposite Rain Forest, with the famous Rain Forest proper, and Knife Edge, where *Eugenia cordata* predominates.

The Veld.

The surrounding country is a flat basalt plateau, over 3000 ft. above the sea-level, through which the Zambesi River is gradually cutting its way back, in a series of zigzags which correspond to parallel planes of weakness in the basalt. The soil, where there is any, is composed of white sand, which is supposed to have been blown down from higher up the river. It supports an open, deciduous, forest-growth, the trees being larger in size than is the case nearer to Bulawayo and in the Matopos. Botanically it might be called a tree steppe, locally it is always the "veld." Where irrigation is possible the soil is fertile, fruit-trees and vegetables having been grown with success.

On this veld, in September, of the trees and shrubs, *Oncoba spinosa*, *Ximenia caffra*, *Diplorrhynchus mossambicensis*, *Royena pallens*, *Olax dissitiflora*, *Bolusanthus speciosus*, and *Vitex flavescens* were found in flower; also in the vicinity of the

Hotel, where the trees had possibly access to extra sources of moisture, and so came earlier into bloom, *Brachystegia appendiculata*, *Acacia Welwitschii*, *Gleditschia africana*, and *Burkea africana*, and, perhaps for the same reason, an *Ochna Antunesii* was a magnificent sight at the Foresters' Camp. Judging from the fruit on the leafless trees, *Combretum*, *Terminalia*, *Bauhinia*, and *Sterculia* sp., with *Afzelia cuanzensis*, *Peltophorum africanum*, and the evergreen *Copaifera coleosperma*, were the most common, including the huge *Adansonia digitata*, which stands out from all the other trees in height, peculiar branching, and smooth red bark.

Below the Falls, in the vicinity of the Zambesi Gorge, and covering the area of the zigzags, we get what was the old bed of the river; and the change in the appearance of the vegetation quite limits this area. Here the basalt is mostly exposed, white patches of zeolite crystals appearing on the surface, also loose lumps of ferric oxide, perforated with round holes, which Professor Penck informed me had evidently been laid down round the roots of the *Phragmites* which fringed the banks and islands when the Zambesi flowed over this area; also loose flints, many of which were collected by Colonel Feilden during the visit of the British Association (1905), lie scattered over the surface. The trees in this area (Pl. **17.** fig. 2) are markedly smaller; *Peucedanum fraxinifolium* and a *Balsamodendron* sp. predominate, with *Ximenia caffra*, a gregarious *Vellozia* sp., and *Myrothamnus flabellifolia* as undershrubs. A *Commiphora* sp. with white papery bark and an *Albizzia* sp. with shining grey bark, with *Euphorbia Reinhardti*, were most conspicuous on the face of the cliff, down to the river, 400 ft. below; the two former, pencilled out against the dark basalt as the sun's rays caught their light bark, and the dark green heads of the latter, emphasized by the general bareness. On the edge of these cliffs *Selaginella imbricata* formed a dense carpet in many places, of course dormant (inrolled) in the drought condition.

Eugenia guineensis * *Formation.*

This would include the immediate banks of the Zambesi River above the Falls, which is here about a mile broad, and the many green islands which dot its surface, both the one and the other being outlined by the above evergreen species, causing that uninterrupted green line along the banks so conspicuous during the dry season, in comparison with the leafless veld. The *Eugenia* is accompanied by a fringe of *Phragmites*, in which *Salix* sp., *Æschynomene cristata*, *Sesamum Baumii*, *Alternanthera sessilis*, *Commelina nudiflora*, *Vigna luteola* var. *villosa*, *Asystasia coromandeliana*, and *Nephrodium unitum* occurred. Clumps of *Papyrus* and the splendid grass *Erianthus teretifolius* break the *Phragmites* ring in places. Succeeding the *Eugenia*, the commonest species comprised young trees of the evergreen *Garcinia Livingstoni* with their long candelabra-like branches, *Kigelia pinnata*, *Trichilia emetica*, *Croton barotsensis*, and *Ficus* sp., with *Crotalaria flavicarinata*, *Byrsocarpus coccineus* var. *parviflorus*, and *Phyllanthus reticulatus* as undershrubs; the trees being covered with a dense growth of lianes, of which the commonest were *Tiliacora funifera*, *Paullinia pinnata*, *Hippocratea obtusifolia*, *Jasminum mauritianum*, *Abrus precatorius*, and the semi-scandent *Capparis tomentosa*. *Erlangea Schinzii* was a common annual, and *Phœnix reclinata* and a *Hyphæne* sp. were abundant, attaining a great height on some of the larger islands.

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* I am indebted to Mr. C. F. Allen for this determination, as this species was not in flower or fruit at the time of my visit.

On the smaller islands there was little or no tree-growth, and beyond the usual fringe of *Phragmites*, a mass of vegetation consisting of *Walafrida chongweensis*, *Hebenstreitia Holubii*, *Pollichia campestris*, *Pavonia hirsuta*, and *Momordica Balsamina* formed a dense growth over the sandy soil.

On the exmerged rocks, which are covered when the river is in flood, the perennial form of *Denekia capensis* with *Floscopa glomerata* and *Hemigraphis prunelloides* flourished; also *Rhamphicarpa tubulosa*, where more soil had accumulated. Of water-plants the Podostemaceæ were represented by three species—the dead remains of a *Sphærothylax* sp. on all exposed surfaces, while in shallow areas *Tristichia alternifolia*, in flower and fruit, covered rocks and stones, and *Tristichia trifaria* from the extreme edge of cataract were growing under water. *Vallisneria spiralis* grew densely where the rocks shelved into deeper waters, the female flowers forming conspicuous floating green masses, where the plant could be no longer seen. *Potamogeton natans* and *Hydrilla verticillata* were very common and the only pond-weeds seen, and floating masses of *Jussieua* sp. occurred near the banks.

The Eugenia cordata *Formation.*

The extreme edge of the cataract is only accessible from Livingstone Island. As the river goes down, pools of stagnant water are left on the rocks of the Island and a bog type of vegetation results. The little terrestrial annuals *Utricularia Kirkii* and *U. firmula*, and the aquatic *U. exoleta*, *Ericaulon subulatum*, *Canscora Kirkii*, *Xyris multicaulis*, with *Denekia capensis*, *Floscopa glomerata*, and *Hemigraphis prunelloides* cover the rocks. Overhanging the very edge of the cataract, *Hygrophila cataractæ* with *Pycreus Mundtii*, *Scirpus paludicola*, *Cyperus Haspan* var. *β. americana* form dense grass-masses, and young *Eugenia cordata* in every stage of growth seem to be gaining ground. These latter show at intervals all along the face of the Falls. On the opposite side of the cataract-gorge is the so-called Rain Forest, the dominant type of which is *Eugenia cordata* (Pl. 17); but it does not occur on the edge of the cliff, as on the cataract side, a fringe of what we might call bog intervening, and this bog-fringe widens considerably towards Danger Point, where the spray falls thickest when the river is in flood. In this area the soil is very thin, and the spray condensing on the surface does not drain off; the same plants occur as on Livingstone Island, and we get also *Nesæa floribunda*, *Rotala longistyla*, *Fuirena Œdipus*, and a dense tangled growth of *Pollinia villosa* with the sedges given above. This bog-area is succeeded by the more or less straight line of the *Eugenia cordata* fringe, which thins out to a single tree in the direction of Danger Point. Most of these Eugenias are very old, with prostrate trunks, and this is also the case with many of the figs. The other Rain Forest trees, lianes, and shrubs seem to be more or less the same as those observed on the upper banks of river and islands, as far as could be seen at this season. In the only two places where the trees of the Rain Forest come to the edge of the cliff they follow two little streams, but in each case the branches do not overhang, but are clipped vertically, absolutely parallel with the face of the cliff. Professor Penck, of Berlin, gave me what appears to be the only possible explanation of this phenomenon, which is, that the enormous mass of water falling over the opposite cliff, 400 feet deep, carries down with it a very large volume of air, which, rushing up the opposite face, effectively prevents any vegetative overgrowth.

As is shown in the photograph, the face of the cliff is bare. This holds for the whole length of the Falls, except in one or two places not so exposed, where small patches of grass have obtained a footing. In the Rain Forest, under the trees, there are few undershrubs, but the ground is thickly carpeted with creeping plants, the following species being dominant in September:—*Eleocharis capitata*, *Hemigraphis prunelloides*, *Cyperus Haspan* var. *β. americana*, *Scirpus paludicola*, *Oplismenus* sp., *Achyranthes aspera*, *Dyschoriste Perrottetii*, and the ubiquitous *Floscopa glomerata*; of ferns, *Nephrodium molle*, *Pteris quadriaurita*, *Cheilanthes farinosa*, *Nephrolepis exaltata*, *Adiantum Capillus-Veneris*, and *A. Oatesii* were plentiful, with the epiphyte *Nephrolepis cordifolia* growing round the trunks of trees, and *Psilotum triquetrum* amongst a dense growth of pleurocarpous mosses towards the base. Where the Rain Forest ceases, beyond the reach of the spray on the east side, we find dense masses of young *Phœnix reclinata*, which is only scattered on the cataract side, with *Phaylopsis longifolia* beneath. *Vernonia senegalensis* and tall Andropogons lead on to the usual tree-veld, which constitutes the east and major part of the first zigzag, the Rain-Forest fringe facing the cataract on the west.

It should be stated that the species enumerated in the body of this paper are only those collected or seen in flower or fruit at the most inauspicious season of the year, and as my visit was of only two weeks' duration, I speak with the greatest reserve on the one or two points which most impressed me.

Matopo Hills.

[*The numbers in brackets refer to the works cited in the bibliography at the end of the paper.*]

The Matopo Hills run in a north-eastern direction, about 30 miles south of Bulawayo, extending over an area about 30 miles broad and over 100 long. They are not a range of hills in the ordinary sense of the term, but consist of bosses of eruptive granite, which, varying in height and in every stage of disintegration, form innumerable kopjes massed one against the other, wooded to the top with or without intervening strips of veld *. The level of the veld varies from 4500 to 5000 feet in the north-eastern direction; the average height of the kopjes is from 100 to 150 feet, but towards the south they are higher.

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* I am indebted to Mr. Mennell for these altitudes.

Silozi, which is the highest of them all, forms an unbroken boss of granite rising on the south-western limit of the hills bordering the so-called "Mopane country." It seems to dominate the whole range, though it can itself hardly be more than 800 feet above the level of the veld. The whole region is in the basin of the Crocodile River, several tributaries of which, flowing through the Hills, are fed by innumerable streams, which either flow over rocky beds or have cut deep gorges through the granite; on passing through the sandy veld they are reduced to deep pools in the dry season, the water percolating underground, forming so-called "sand-rivers." The North-eastern region is very much better watered than about the Rhodes Estate, which is more to the west, resulting in a finer growth of trees; and there, in the wider valleys, large bog-areas occur, or so-called vleis, which, I was told, are more or less under water during and after the rains. The limits of these areas were well defined by the pretty blue flowers of *Lobelia decipiens*; *Xyris capensis*, *Pæpalanthus Wahlbergii*, *Eriocaulon matopense*, the terrestrial *Utricularia transrugosa*, with its showy mauve flowers, and in October the leafless spikes of *Gladiolus Melleri*, with flowers of a terra-cotta red, were scattered and general. The latter may also be said of *Senecio tenellulus*, *S. erubescens*, and *Gerbera piloselloides*, which were limited to the vleis. *Utricularia Welwitschii* and *Genlisea africana* were more local, also *Lycopodium carolinianum*. Where the edge of this vlei ground drained over a granite surface, it would be gay with the yellow *Utricularia exoleta* and the most minute *U. firmula*, *Hypericum Lalandii*, and the mauve heads of *Denekia capensis* and *Lobelia minutidentata*. It is in these bog-areas that most of the choicest bulbs come up as the rains commence.

The veld is the same typical tree-veld, which appears to be the vegetative type for the whole country, broken here in many places, especially in the valleys, by so-called "old Kaffir lands," where the ground was formerly under cultivation. The Kaffirs are continually moving their kraals, as the ground in the vicinity becomes exhausted; their "gardens" can be seen all through the Hills under present cultivation, in some places covering large areas, by streams, and even up in the kopjes where there is sufficient space. The land is dug and some crops are sown at the end of the dry season. The trees are generally lopped, the natives not troubling to cut them down, and this practice, continued for a few years, possibly weakens growth too much to resist the attacks of white ants, which consume all vegetable remains in the shape of dead and decaying wood, covering objects first with their channels of red earth, which conserve the shape of everything attacked, until on a touch it all crumbles into dust. The annual occurring veld fires effectively sweep off any secondary tree-growth, so these areas remain bare, generally distinguished by the occurrence of smaller and finer grass species. Many of the very widely distributed plants seem chiefly limited to land under past or present cultivation, like *Ceratotheca triloba*, *Phyllanthus Niruri*, *Mahernia abyssinica*, and *Blumea gariepina*.

The soil of the veld is generally sandy, composed of disintegrated granite, and the plants typically limited to it are characterized by certain trends of development. There is the prostrate type of herbaceous plant, with a dense mat of branches, which might almost be described as running dorsiventrally along the ground, not rooting at the nodes, radiating equally all round from a common rootstock, such as *Tephrosia radicans*, *T. lupinifolia*, *Hermannia brachypetala*, *Bergia decumbens*, *Pretrea zanguebarica*; or dwarf shrubs, like *Anthospermum ciliare*, *Helichrysum ericæfolium*, *H. leptolepis*, *Hermannia viscosa*, *H. depressa*, *Sida longipes*, and *Polygala rigens*; small erect perennials, such as *Vahlia capensis*, *Lasiosiphon Kraussii*, *Acalypha zambesica* and *A. peduncularis*, *Vernonia Kraussii*, *Epaltes gariepina*, *Euphorbia benguellensis*, *Monsonia Burkeana*, *Dicliptera Melleri*, and many Leguminosæ; also *Ocimum obovatum* and *Rhamphicarpa montana* with decumbent branches. Then we get those interesting veld types which hurry to get their flowering over before the rains begin, such as *Anona senegalensis*, *Odina edulis*, and *Canthium abbreviatum*. These have flowers in the axils of the lower leaves only, the upper leaves being aggregated towards the apex of the shoots, unfolding as the latter elongates, whereas *Triumfetta Welwitschii*, *Trichodesma physaloides*, and *Senecio lasiorhizus* send up their flowering-shoots first, the two former subsequently developing vegetative shoots, while the latter produces large radical leaves, of which I only saw last season's remains. *Pharnacium Zeyheri*, *Helichrysum argyrosphærum*, and *Lightfootia tenuifolia* were the only veld annuals seen. Of bulbs, *Hypoxis villosa* is the first to show its bright yellow blossoms; *Albuca caudata*, *Scilla lanceæfolia*, and *Buphane disticha*, all flowering before the leaves, were common. These plants all come up after the veld fires. Of succulent plants there were very few. A *Stapelia* sp. in fruit only (now doing well in the Chelsea Physic Garden) formed patches by granite rocks; one or two *Kalanchoe* in fruit, a gregarious stemless Aloe, and in one locality a *Crassula* sp. were the only representatives seen, unless we include *Justicia elegantula*, on the strength of its fleshy underground radical leaves.

In the kopjes where the soil is a very rich black humus, from the decayed leaves which aggregate between the rock-fissures and crevices, the growth of trees is sometimes finer, and many trees seem limited to these areas. The fires run up the kopjes every year, as systematically as over the veld, but the enormous boulders the granite breaks up into afford a certain protection, and so allow the growth of some handsome symmetrical trees.

Large areas of bare lichen-covered granite occur, interspersed by a network of cracks, and in these *Elephantorrhiza Burkii*, *Asclepias tenuifolia*, a *Vellozia* sp., and *Sarcostemma viminale* run for some distance; *Myrothamnus flabellifolia*, with the *Vellozia*, also favours shallow pans in the granite, and *Selaginella rupestris* spreads in white masses at this season, wherever it finds any holding, possibly succeeding the lichens as a soil-producer. A very characteristic kopje type, gregarious, is the tree *Euphorbia angularis* (Pl. **19**), often associated with an arborescent Aloe; the only other tree-form, *E. Reinhardtii*, occurring always scattered, on both veld and kopjes. Of plants not collected, *Pteris longifolia* and *Osmunda regalis* are very general on the banks of streams, the latter forming large patches in shallow standing water; *Jasminum stenolobum*, a veld plant, is common, sending up single branches, not a metre long, covered with flowers and leaves, and was found associated with *Clerodendron myricoides*, of similar habit.

Terminalia sericea is one of the dominant veld trees, and a *Strychnos* sp. (Kaffir orange), with round gourd-like fruit and an edible pulp of Medlar consistency, much affected by baboons, is most conspicuous while the fruit is still hanging on the trees, on veld and kopjes.

In considering this type of Plant Association, two salient facts stand out.

Firstly, the absence of gregariousness, or the dominance over a certain area of any one species. Two exceptions to this rule were *Protea abyssinica*, on the "Sand veld" near Fort Usher, and a *Brachystegia* sp. which clothed the slopes, 500 feet deep, of a remote valley. At the time of my visit, the latter was a lovely sight, just unfolding the young spring foliage of a tender red hue. Old fruit still hung on the trees, which decided the genus, but locally, I believe, it is called the "Mountain Acacia." The trees were very fine, with tall straight trunks, averaging about 80 cm. in diameter at a height of 1·5 metres. *Afzelia cuanzensis* (Pl. **20**) generally occurs in groups, and the handsome evergreen *Parinarium Mobola* is often seen, two or three together, also *Pterocarpus angolensis* and *Faurea saligna* (Pl. **18**). The same remarks hold for the veld plants, with the exception of *Trichodesma physaloides*, but with vlei plants and those occurring near streams it does not appear to be so marked.

Secondly, the way each plant seems to respond to its individual needs, as dictated by environment, in the throwing-off of the old and the growth of new leaves and also the flowering period. I saw groups of *Afzelia cuanzensis* in full leaf and flower, when others would be still quite bare. *Moschosma riparium* flowered without or with the young leaves according to situation, also *Turræa Randii*, *Tricalysia jasminiflora*, *Hexalobus senegalensis*, and *Brachylæna rhodesiana* were similarly influenced, flowering with or after throwing off the old leaves. *Ficus lutea* by a stream would be in the full flush of its young red spring foliage, whereas up a kopje it would still be covered with last year's leaves, and perhaps in another situation only the bare branches would be visible, with all the leaves on the ground below. Both these above facts make for a sort of uniformity of effect, and though the individual species, if isolated, would be most striking in flower or foliage, as it is they are lost in the heterogeneous mass.

From this point of view, it is a matter for regret that local effort, instead of constantly striving to introduce foreign and often unsuitable species, does not try to give the native plants full scope. The results would be of real botanical interest, and perhaps not only lead to less uniformity of surrounding vegetation, but might awaken some interest amongst those who have made Rhodesia their home in the many very lovely types with which nature has favoured their country.

Here, again, I should like to repeat that the above remarks are made with all reserve, and only refer to the months of August, September, and October, when I was in the country. With regard to the habitats, I have given them as I found them, but many plants which only flower near water under drought conditions may be general when those cease.

In conclusion, I must express my great indebtedness to the unvarying interest, help, and kindness received from the Staff of the Herbarium, Royal Botanic Gardens, Kew, and of the British Museum, where I worked out my collection, especially to Mr. E. G. Baker, Mr. Spencer Moore, Dr. Stapf, Mr. C. B. Clarke, and Mr. J. G. Baker, also to Dr. Rendle, to Mr. Henry Groves, Miss Lorrain Smith, Mr. Arthur Bennett, and to Professor Farmer; to Dr. Harry Bolus of Cape Town, and to Mr. M. Jackson, Mr. P. Fuller, Mr. H. Steigewald, and Mr. C. E. F. Allen in Rhodesia, for their kindness in affording facilities for botanical work.

Duplicates of nearly all the above plants are in the British Museum and at Dr. Bolus's Herbarium at Cape Town.

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EXPLANATION OF PLATES 17–20.

Plate 17.

Fig. 1. *Eugenia cordata* and *Ficus* sp., clipped where Rain Forest reaches edge of cliff. Vegetation at Victoria Falls.

2. *Balsamodendron* sp., with *Selaginella imbricata* carpeting. Vegetation of veld, on edge of Lower Zambesi gorge.

Plate 18.

Fig. 3. *Parinarium Mobola* and *Faurea saligna* (left), showing burnt veld in foreground. Vegetation of Matopo Hills.

4. Young *Parinarium Mobola*, with *Andropogon* sp. in foreground. *Combretum* sp. (right), before burning. Vegetation of Matopo Hills.

Plate 19.

Fig. 5. Unknown tree in foreground, looking over veld and kopjes, with old Kaffir land to the left. Vegetation of Matopo Hills.

6. *Euphorbia angularis*, with young plants of same in foreground. *Commiphora* sp. and *Myrothamnus flabellifolia*. Vegetation of kopjes, Matopo Hills.

Plate 20.

Fig. 7. *Viscum verrucosum* on *Ficus* sp. Vegetation on kopjes, Matopo Hills.

8. *Afzelia cuanzensis*, in flower. *Andropogon* sp. in foreground. *Terminalia silozensis* in distance. Vegetation of Matopo Hills.

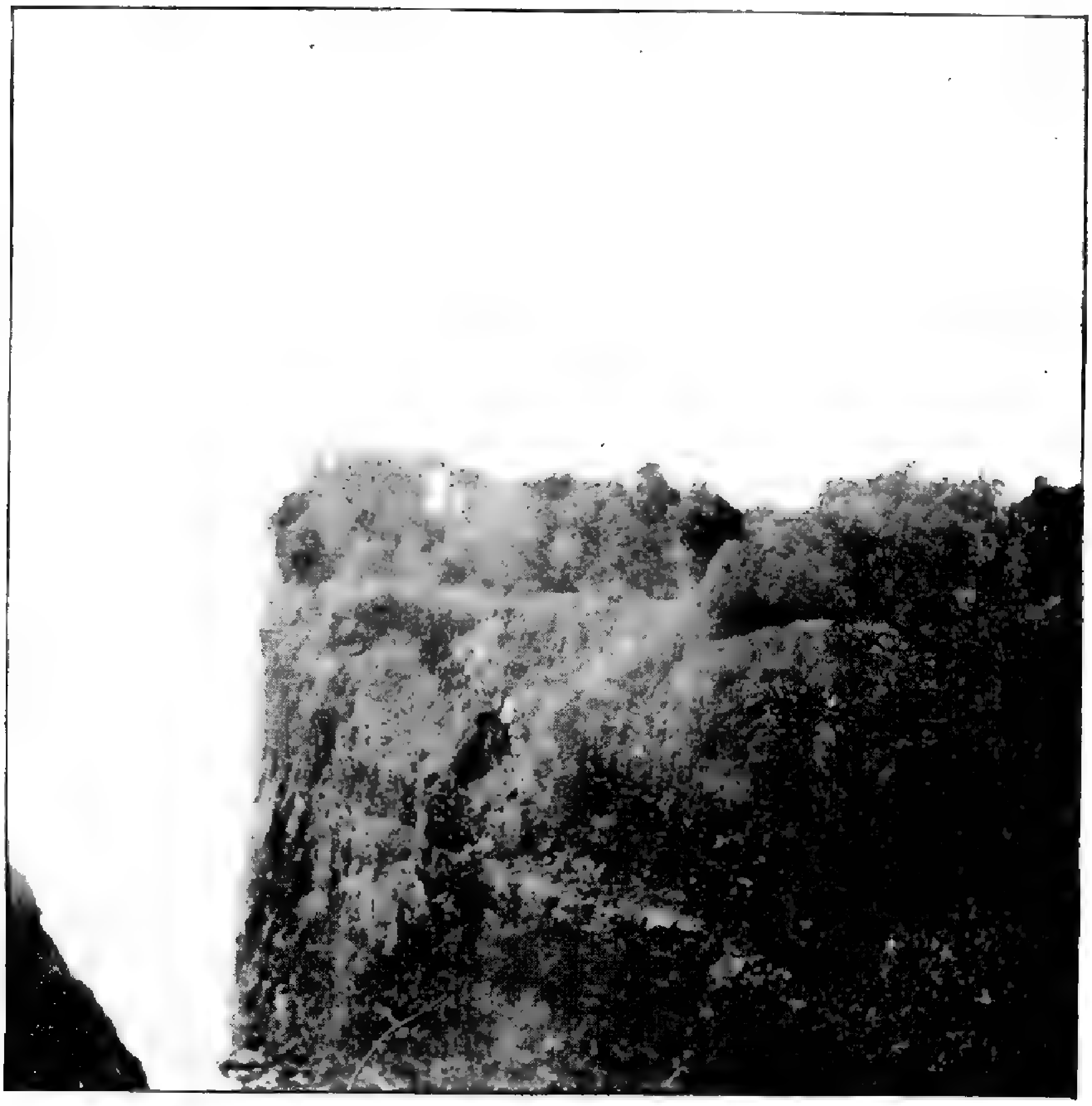


FIG. 1.

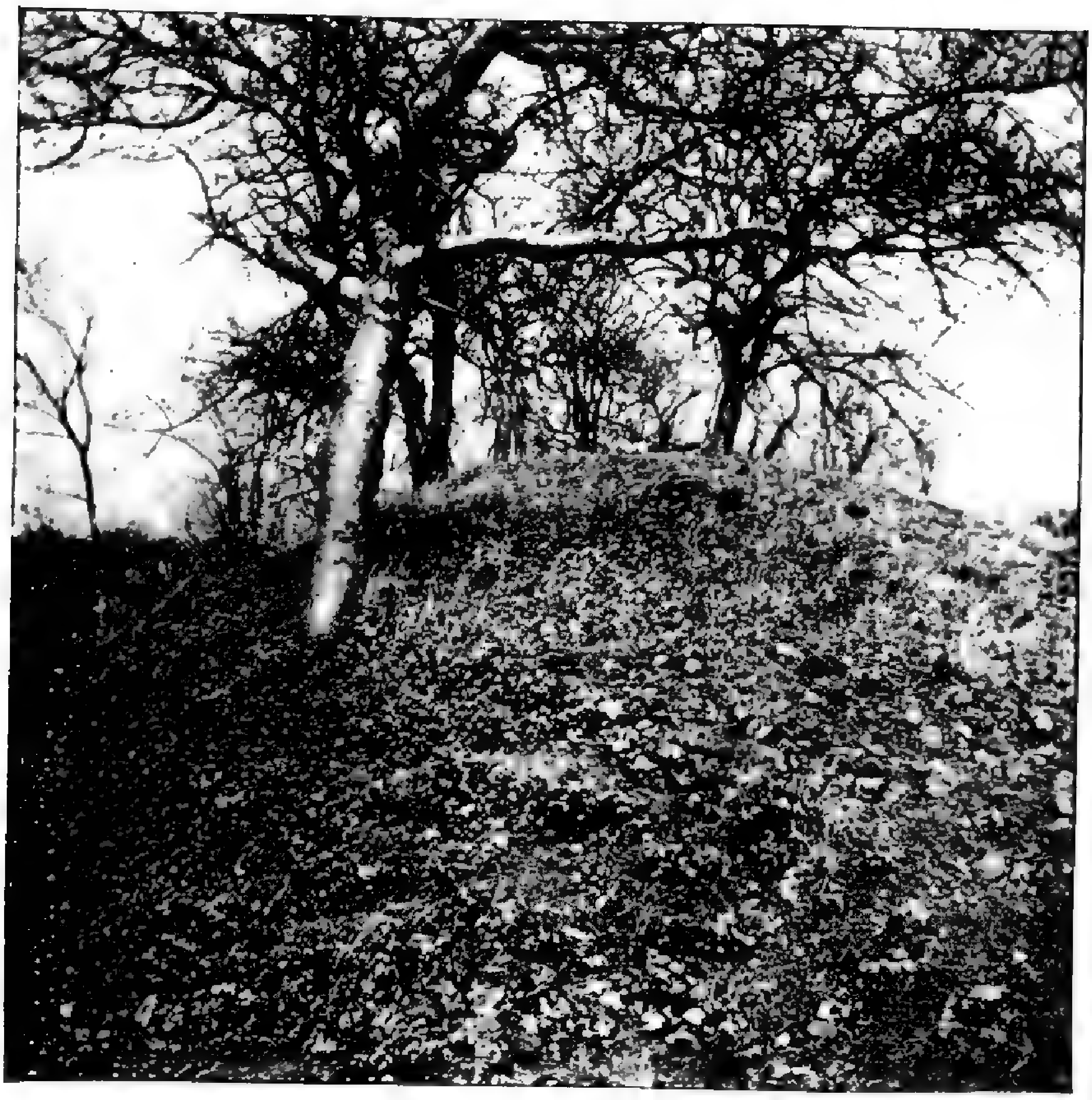


FIG. 2.

BOTANY OF SOUTHERN RHODESIA.

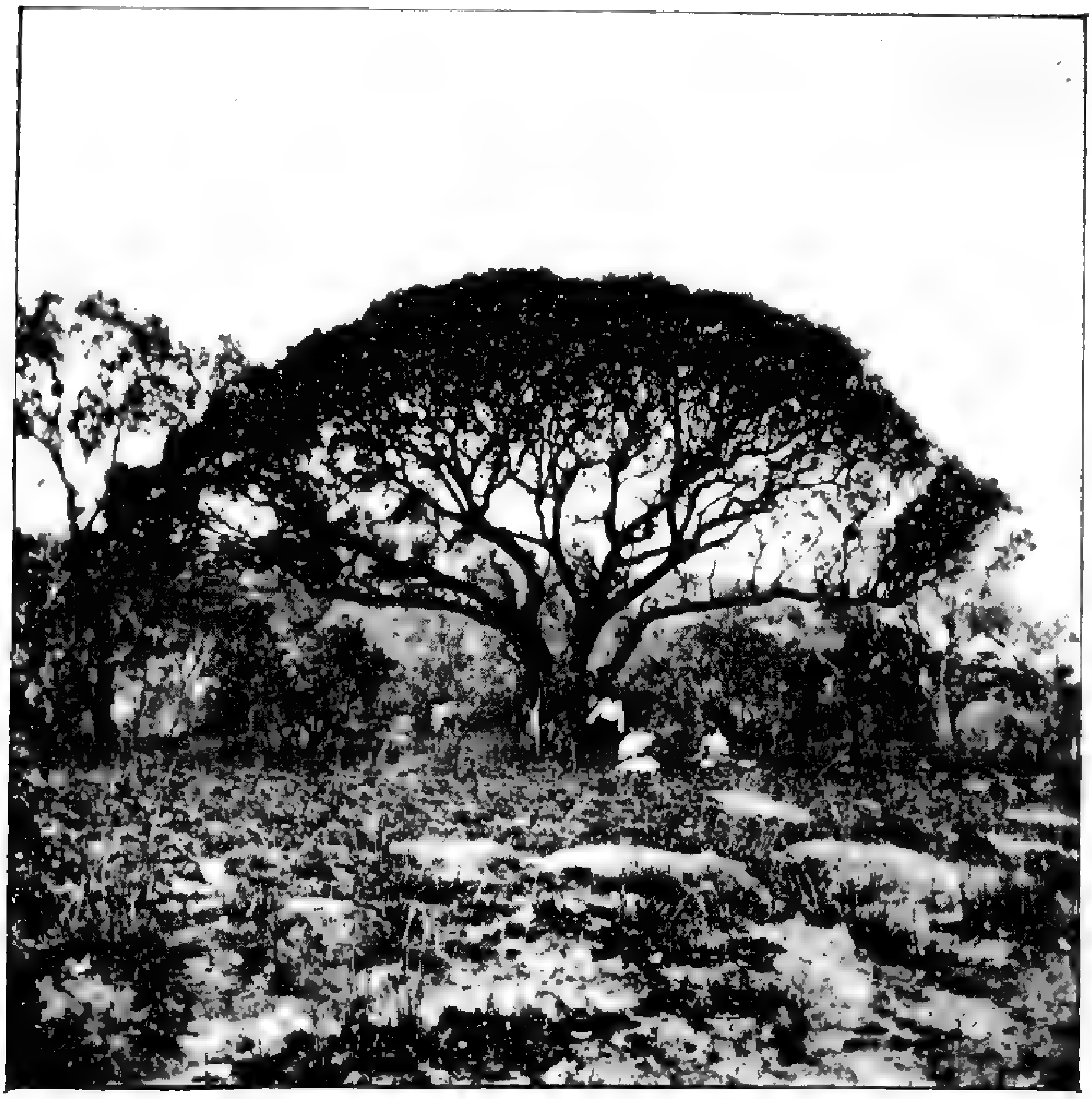


FIG. 3.

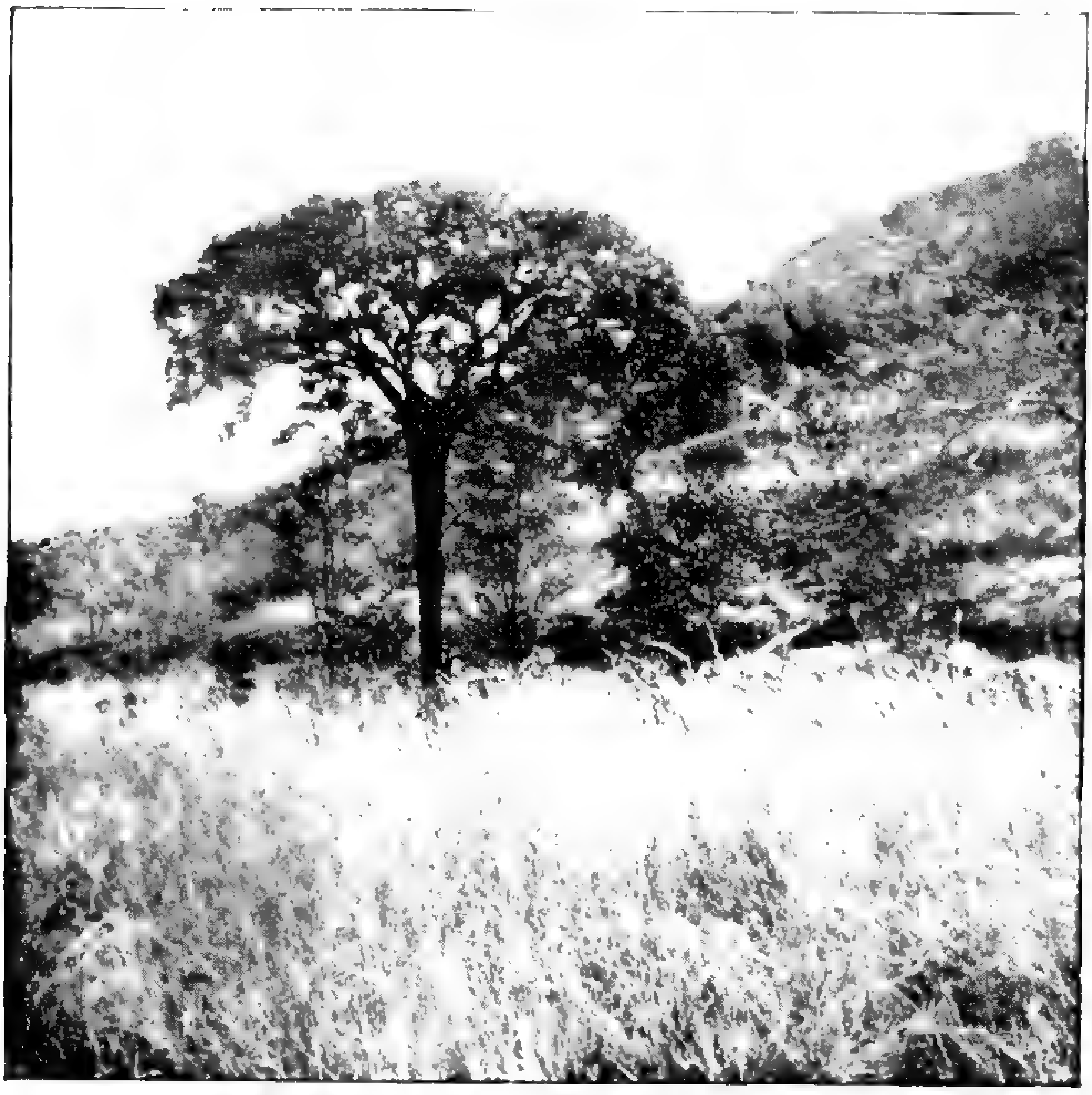


FIG. 1.

BOTANY OF SOUTHERN RHODESIA.

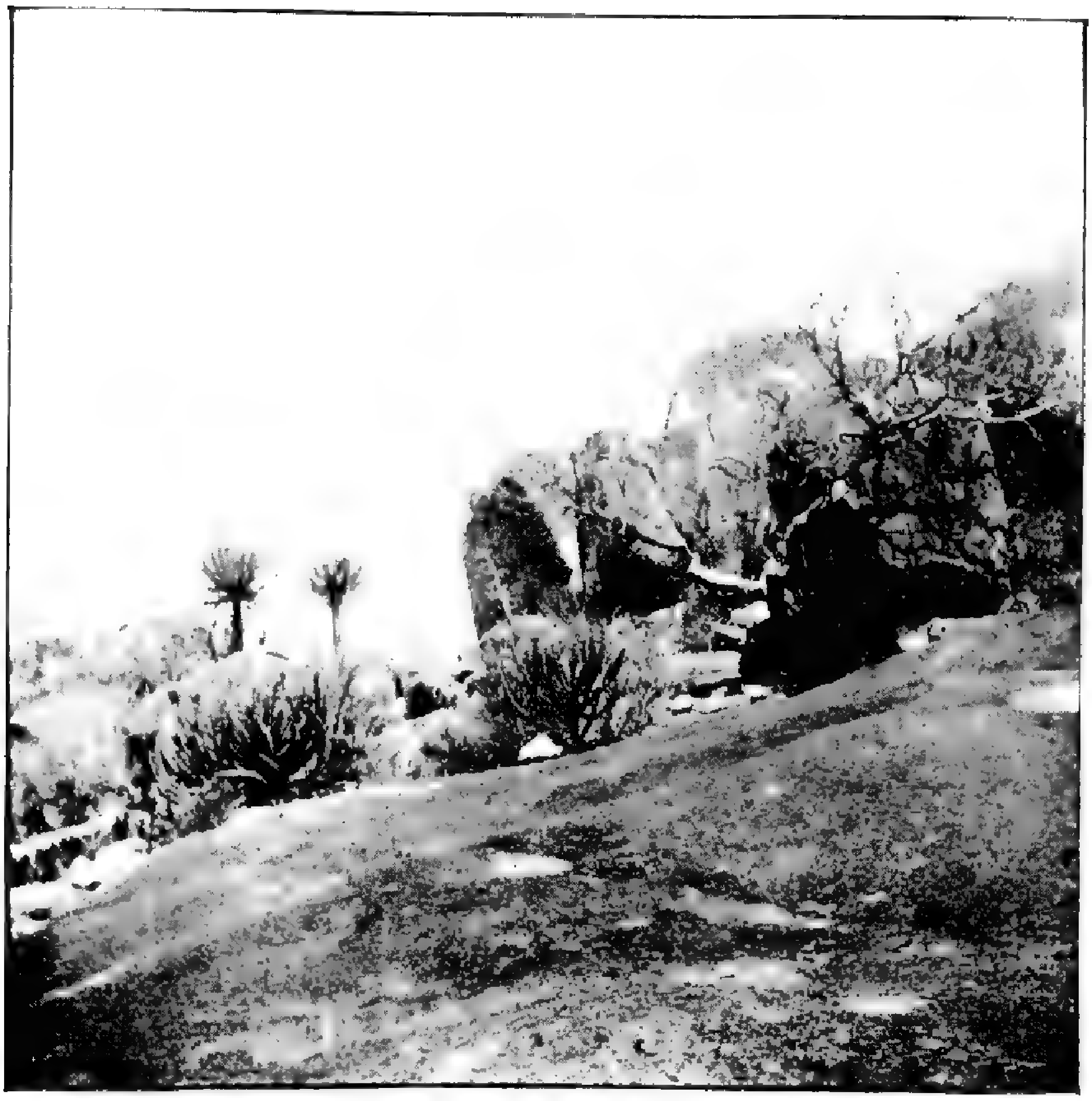


FIG. 5.

FIG. 6.

BOTANY OF SOUTHERN RHODESIA.

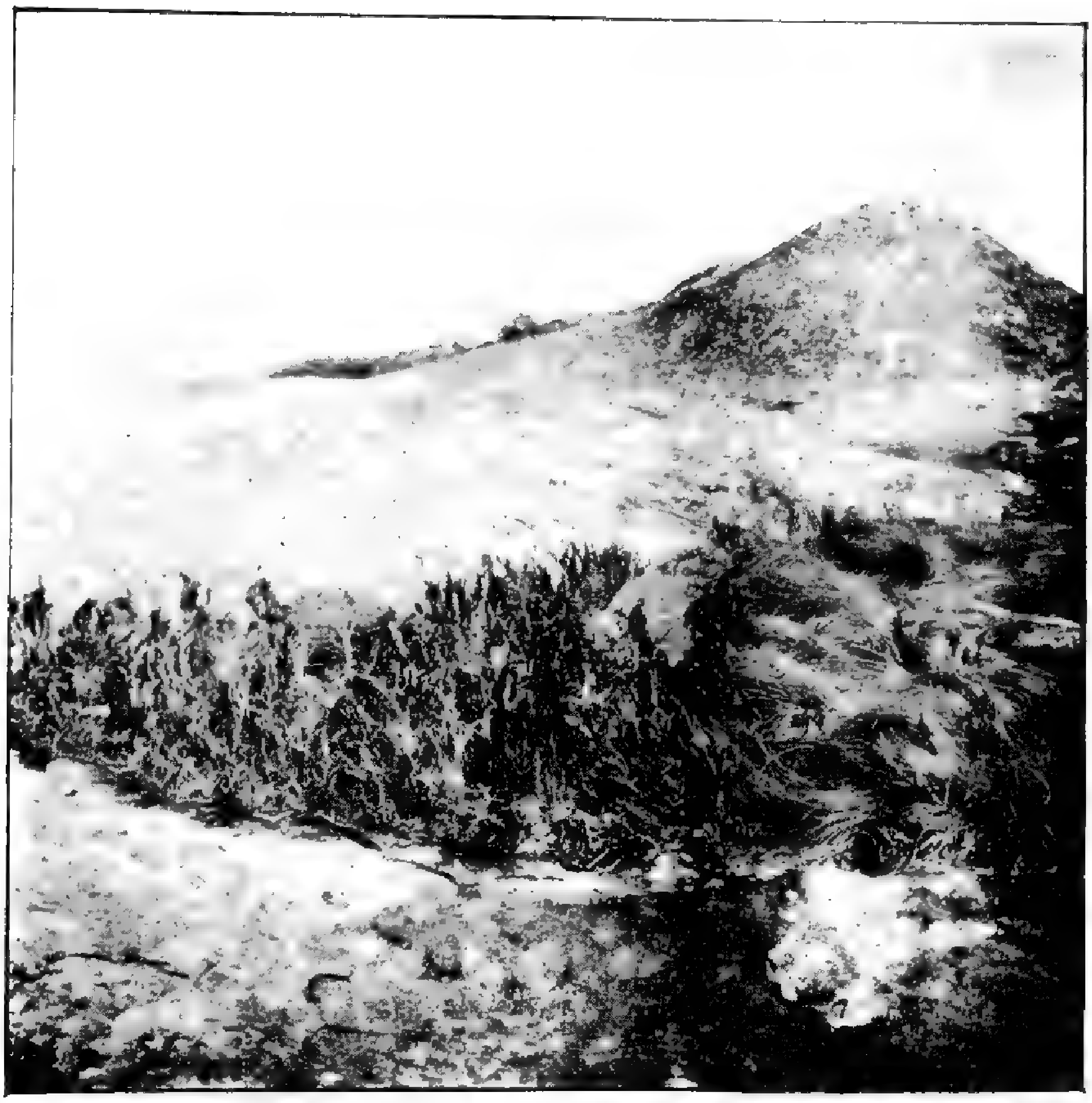


FIG. 7.

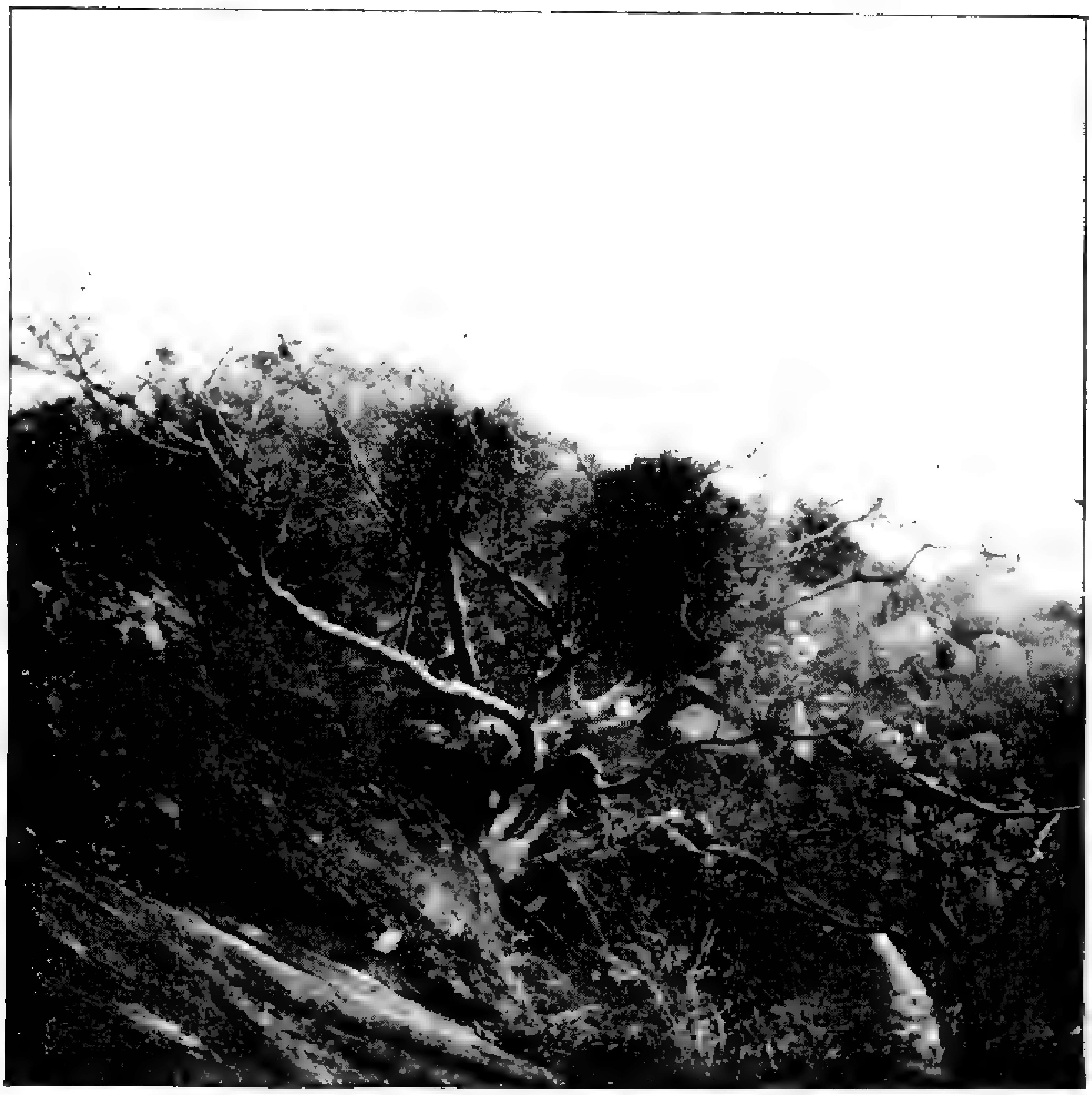


FIG. 8.

BOTANY OF SOUTHERN RHODESIA.

Plantæ Novæ Daweanæ in Uganda lectæ. By Otto Stapf, Ph.D., F.L.S. In collaboration with T. A. Sprague, B.Sc., F.L.S., R. A. Rolfe, A.L.S., C. B. Clarke, M.A., F.R.S., F.L.S., M. T. Dawe, and C. H. Wright, A.L.S.; and with an Appendix by M. T. Dawe.

(Plates **21** & **22**; and Map.)

[Read 21st June, 1906.]

Introduction.

Early in April of last year Mr. M. T. Dawe, Officer in Charge of the Forestry and Scientific Department of the Uganda Protectorate, started with the sanction of the then Acting Commissioner for Uganda, Mr. George Wilson, from his headquarters at Entebbe, on an expedition through Buddu and the Western and Nile Provinces of the Uganda Protectorate. The object of the expedition was in the first place the exploration of the forests of the districts mentioned, and secondly a general botanical survey of the country traversed. After an arduous and extremely successful journey, Mr. Dawe arrived at Gondokoro late in November of the same year, when his mission came to an end and he went home on leave. A complete set of his collections had meanwhile in several instalments reached Kew *via* Entebbe. They were taken in hand as they arrived, and with his active assistance it was possible to supply him early in the present year with a list of the names of the plants collected by him.

An account of his expedition, including an enumeration of the plants of his collections, was published as a Blue Paper last April under the title "Report on a Botanical Mission through the Forest Districts of Buddu and the Western and Nile Provinces of the Uganda Protectorate" (London, H.M. Stationery Office; Cd. 2904), pp. 1–63, and 5 plates. As it was desirable that the report should be published without delay, it was not possible to work out the descriptions of the numerous new species in time to be included in the report. Thus a considerable number of "nomina nuda" found their way into it, and it is the object of the present paper to supplement the report in that respect by adding the necessary technical descriptions.

As Mr. Dawe's official report may not be generally accessible, I suggested to him that it would be useful to have a condensed account of the principal features of the vegetation of the districts visited. He was good enough to supply me with what is really a summary of the botanical contents of his report, with some additional information on the climatic conditions and the general nature of the country. He also added a sketch-map to illustrate the route of the tour, the location of the districts, and the distribution of forest and open land.

I propose to add Mr. Dawe's contribution as an appendix to our joint paper. I would fain have introduced a more definite œcological terminology similar to that used by Professor Engler in his valuable contributions on the plant geography of Tropical, and particularly of East Africa, so as to facilitate comparison. I found, however, I could not do it without a greater loss of time than I could afford, or the risk of misrepresenting Mr. Dawe's statements, and confined myself therefore to a few purely editorial alterations. I would, however, observe that a uniform and classified terminology is as desirable for the description of the vegetation of a country as it is necessary, for instance, for that of morphological objects, although, of course, it can never claim the same degree of precision owing to the complication and diversity of the conditions which determine the character of a vegetation.

I may be allowed to add a few words of appreciation of the scientific results of Mr. Dawe's expedition. They consist, firstly, in the addition to science of a considerable number of new types. They are by no means exhausted in the present paper, which, as I have explained, is mainly intended to give a *locus standi* to the new names introduced into the report. Others which are not specially mentioned because they were not of sufficient importance for the purposes of the report, or would have required too extensive researches, will follow as time permits and occasion arises. Then there are a great many species which, although already known, are new to the provinces visited by Mr. Dawe. As to them I must refer to the enumeration in the official report. Of equal value is Mr. Dawe's attempt at a more precise circumscription of the forest areas in the Equatorial Lake Region and their analysis. In both respects our knowledge was so far of the most general character. That part of his work is particularly interesting in regard to the West African element present, a factor the importance of which in its bearing on the history of the African Continent has already been pointed out twelve years ago by Dr. Stuhlmann in his suggestive summary in the concluding chapter of his work 'With Emin Pasha in the Heart of Africa.' Thus far Mr. Dawe's account also supplements the survey work of the botanist of the Anglo-German Boundary Commission, the results of which were issued in no. 259 of the Journal of this Society last year. It was indeed very tempting to follow up by means of Mr. Dawe's collections the question of the extent and character of the West African Hylæa element in the heart of Africa, or that of the remarkably mixed highland flora of Mt. Ruwenzori; but this would have required an extensive revision of all the material available from that region, and thus widened the scope of this paper far beyond reasonable limits.

My own and my collaborators' shares in the descriptive part of the paper are evident from the authors' names after those of the species; but I ought to mention that a not inconsiderable part of the preliminary work of comparing Mr. Dawe's collection was done by Mr. J. Hutchinson, temporary Assistant at Kew.

VIOLACEÆ.

Alsodeia Dawei, *Sprague*, sp. nov.; ab affini *A. longicuspide*, Engl., ovario glabro recedit.

Frutex ramulis gracilibus, junioribus patenter pubescentibus mox glabrescentibus. *Folia* alterna, petiolo 1–4 cm. longo, patenter pubescente, supra canaliculato, lamina obovato-oblanceolata, 9–16 cm. longa, 3–6·5 cm. lata, grossiuscule obtuse serrata, apice longiuscule acute acuminata, basi obtuse cuneata, utrinque minute crebre reticulata, rete supra inconspicuo, subtus magis obvio, vena media et lateralibus (utrinque 8–11) supra prominulis subtus prominentibus, vena media subtus ± pubescente, lamina cæterum glabra. *Paniculæ* iis *A. longicuspidis* conformes, rhachi puberula, demum glabrata, bracteis deltoideis obtusissimis, 2 mm. longis, basi 2 mm. latis, minute nigro-apiculatis, margine ciliatis, extra medio pilosis, cæterum glabris, pedicellis 4 mm. longis, sparse pubescentibus. *Sepala* late elliptica vel ovato-elliptica, ciliata, extra sparse, intus breviter minute appresse pubescentia, 4–4·5 mm. longa, 3–3·5 mm. lata. *Petala* spathulato-oblonga, 6–7 mm. longa, 2·5 mm. lata, apice rotundata, infra medium ciliata, intus triente superiore glabra,

cæterum basi excepta pubescentia, extra infra medium versus margines pubescentia cæterum glabra. *Tubus staminalis* truncatus, integer, 1·25 mm. longus, utrinque glaber, connectivo supra loculos extrorse producto, toto 3·5 mm. longo, loculis utrinque pilosis, interioribus 2 mm. longis, exterioribus 1·25–1·5 mm. longis, appendice membranaceo, ovato, obtuso, integro, ciliato, vix ·5 mm. longo. *Ovarium* ovoideum, 3 mm. longum, 2 mm. diametro, glabrum, stylo circa 3 mm. longo. *Capsula* ovoidea, 1–1·3 mm. longa.

Toro: Kibale Forest, 1500 m., *Dawe*, 516.

CANELLACEÆ.

Warburgia ugandensis, *Sprague*, sp. nov.; a *W. Stuhlmannii*, Engl., petalis longioribus, stigmate subcapitato, ovulis numerosioribus placentis biseriatim affixis recedit. (Pl. **21.**)

Arbor usque 27 m. alta, 3–4 m. ambitu. *Ramuli* teretes, 3·5 mm. diametro, cortice striato ruguloso lenticelloso fulvo-cinereo glabro; gemma terminalis acute subulata, usque ad 3·5 cm. longa. *Folia* breviter petiolata; lamina oblanceolata, apice breviter obtuse acuminata, basi in petiolum anguste alatum, 0·5–1 cm. longum, attenuata, 5–12 cm. longa, 1·5–3 cm. lata, integra, dense pellucido-punctata, margine reflexo, supra nitidula venis leviter prominulis, subtus pallidior venis inconspicuis, rete venularum satis denso, costa prominente brunnea. *Cymæ* axillares, simplices, usque ad 4-floræ; pedicelli basi articulati, circa 1·5 mm. longi. *Sepala* 3, imbricata, transverse elliptica, 2 mm. longa, 3–3·5 mm. lata, minute ciliata. *Petala exteriora* 5, elliptico-oblonga, rotundata, concava, 5 mm. longa, 2·5–3·5 mm. lata (explanata), intus subarachnoideo-pubescentia vel glabriuscula. *Petala interiora* superne induplicato-valvata, 5, oblonga, apice rotundata, basin versus paullo angustata, 4 mm. longa, circa 1·5 mm. lata, glabra. *Tubus staminalis* vix 5 mm. longus, apice decemcrenulatus; antheræ circa 3 mm. supra basin tubi sitæ, circa 2 mm. longæ. *Ovarium* oblongo-ovoideum, 3·5 mm. longum, 1–1·5 mm. diametro, glabrum; stigma subsessile, subcapitatum, angulatum, inferne mucilagineo-pilosum; placentæ 5, parietales, pluriovulatæ, ovulis irregulariter biseriatis. *Bacca* subglobosa, obtuse apiculata, 3·5–4 cm. diametro, pericarpio coriaceo. *Semina* numerosa, in pulpa carnosa nidulantia, subreniformia, vix ultra 1 cm. longa, circa 7 mm. lata; endospermium

copiosum carnosum; embryo in semicirculum curvatus, circa peripheriam seminis situs, 1 cm. longus vel ultra, radicula cylindrica quam cotyledone longiore et crassiore; cotyledones paullo inæquales, plano-convexæ, apicem versus sensim angustatæ.

Toro: Kibale Forest, 1300 m., *Dawe*, 510. Native name, "Masuko."

W. ugandensis appeared in Mr. Dawe's *Report* under the provisional name *Dawea ugandensis*, Sprague (gen. nov. Bixacearum). Further examination has proved it to be one of the Canellaceæ, and although it differs from Engler's and Warburg's descriptions of *Warburgia* in having the ovules biseriately arranged on the placentæ and in the subcapitate stigma, it seems desirable to refer it for the present to that genus.—T. A. S.

Mr. L. A. Boodle, F.L.S., has kindly supplied the following account of the anatomy of *W. ugandensis*.

An examination of the structure of this species gave the following results. Secretory cells are present in the palisade and spongy tissue of the leaf, in the petiole, and in the cortex, phloem, and pith of the stem. In the wood there are vessels with long scalariform perforations, narrow medullary rays (1–2 cells broad), and wood-prosenchyma with very distinct bordered pits. The periderm is superficial, and the cork-cells have thin walls. The medullary rays in the phloem increase in breadth from within outwards. The petiole contains three vascular bundles.

In all these features the anatomy agrees with that of the American genera of Canellaceæ, as summarised by Solereder (Syst. Anat. Dicot. p. 97), and according to Engler (Pflanzenw. Ost-Afr. C. 276) a similar structural agreement is shown by *Warburgia Stuhlmannii*, Engl. It is specially interesting that there should be such a close similarity in structure between the American and African genera of this Order. Regarding one feature in *W. ugandensis*, Sprague, I cannot speak definitely; thickening of the inner walls in the phelloderm had only begun in a few cells, hence it would be necessary to examine older specimens of the stem, to determine whether the phelloderm subsequently assumes the structure typical of the Order.—L. A. B.

FLACOURTIACEÆ.

Rawsonia ugandensis, *Dawe et Sprague*, sp. nov.; ramulis novellis et spicis tomellis, foliis argute spinuloso-serratis abrupte acuminatis a ceteris speciebus distinguitur.

Frutex vel *arbor* parva, ramulis cinereo-fuscis, 3–4 mm. diametro, novellis dense brunneo-tomentellis. *Petioli* 5–10 mm. longi, supra valde sulcati, juventute tomentelli, demum glabrescentes. *Lamina* obovato-oblonga vel oblonga, longe satis abrupte acute acuminata, acumine 1–2 cm. longo, basi obtuse cuneata, 8–14 cm. longa, 3–5 cm. lata, spinuloso-serrata, rigide coriacea, glabra, subnitidula, venis et venulis supra prominulis subtus prominentibus, reticulatione densa manifesta; venæ laterales utrinque 9–10, ascendentes. *Spicæ* axillares, 5–10-floræ, 1·5–2 cm. longæ; rhachis leviter flexuosa, brunneo-tomentella. *Flores* exstantes hermaphroditi. *Tepala* circa 10, dense ciliata, cæterum glabra, exteriora minima orbicularia, interiora sensim majora, minus coriacea, intima elliptica circa 7 mm. longa et 4 mm. lata (explanata), superne tantum ciliata. *Squamæ petaloideæ* (sensu *Harvey* et *Warburg*) 5, elliptico-oblongæ, minute ciliatæ, 6–7 mm. longæ, 3–3·5 mm. latæ (explanatæ), basi interne appendice adnata elliptica 2–3 mm. longa 1–2 mm. lata densissime pilosa. *Stamina* circa 20; filamenta 5–6 mm. longa, glabra; antheræ oblongæ, 2 mm. longæ, minute apiculatæ, basi subsagittatæ. *Ovarium* ovoideum, placentis parietalibus 3 rarius 4, ovulis numerosis; stigma sessile, tripartitum, ramis patentibus, rarius quadripartitum. *Fructus* immaturi ovoidei, 6–7 mm. longi, infra stigma in collum circa 1 mm. longum angustati, stigmatis ramis vix 2 mm. longis.

Bugoma Forest, 1100 m., *Dawe*, 946.

MALVACEÆ.

Bombax reflexum, *Sprague*, sp. nov.; a *B. buonopozensi*, Beauv., cui affine, floribus majoribus, calyce extra pubescente, petalis intus dense pubescentibus, stigmatibus reflexis recedit.

Arbor 27–30 m. alta, 1–3 m. diametro, statu juvenili (*Welwitsch*) vel etiam adulto (*Dawe*) aculeata. *Ramuli* 0·5–1 cm. diametro, cortice mox rugoso. *Folia* 5–7-foliolata, glabra; petiolus 10–25 cm. longus, semiteres, profunde sulcatus; foliola subsessilia vel breviter petiolulata, petiolulis anguste alatis

5–10 mm. longis, oblanceolata, breviter acuminata, 6–16 cm. longa, 2·5–5·5 cm. lata, chartacea vel tenuiter coriacea, venis lateralibus utrinque 13–20 patulis, prope marginem arcuatim anastomosantibus, supra ut costa prominulis, subtus paullo magis prominentibus, costa prominente. *Calyx* cupularis, 1–1·5 cm. altus (explanatus 3–3·5 cm. diametro), extra rugosus, pilis stellatis brunneo-pubescens vel inferne tomentellus, intus longe dense simpliciter sericeo-villosus. *Petala* oblonga, apice rotundata, in basin paullo angustata, 6–8 cm. longa, 3–4 cm. lata, extra minute velutino-tomentosa, intus dense pubescentia vel subtomentosa. *Staminum phalanges* 5, filamentis circa 7 mm. connatis, inde circa 3 cm. liberis, conspicue patenter pilosis præsertim inferne. *Ovarium* haud visum; stylus circa 4 cm. longus, stigmatibus circa 5 mm. longis valde reflexis.—*B. buonopozensis*, Hiern, Cat. Welw. Afr. Pl. i. 80, non Beauv.

UGANDA: Semliki Valley, 900 m., *Dawe*, 646.

ANGOLA: Golungo Alto, Capopa, *Welwitsch*, 5412, 5413.

STERCULIACEÆ.

Dombeya Dawei, *Sprague*, sp. nov. (§ Eudombeya); a *D. auriculata*, K. Schum., cui affinis, petiolis longipilosis, stipulis angustioribus, tubo staminali multo breviore, ovulis numerosioribus recedit.

Frutex 3 m. altus, ramis pallide brunneis, novellis brunneopilosis mox glabrescentibus. *Petiolus* semiteres, longipilosus, 4–7·5 cm. longus. *Lamina* late ovata, acuminata, sæpius ± triloba, basi alte cordata, lobis lateralibus acutis, 9–15 cm. longa, 6·5–12·5 cm. lata, supra pilis stellatis inæqualibus pubescens, pubescentia rudi, subtus tomentosa, basi 7- vel sub-9-venia, venis lateralibus cæteris utrinque 4–5, supra ob indumentum densius manifestis, subtus ut rete venularum satis prominentibus. *Stipulæ* lanceolatæ, acute acuminatæ, basi axin versus paullo auriculatæ, 10–13 mm. longæ, 2–3 mm. latæ, puberulæ. *Pedunculi* axillares, 2·5–6·5 cm. longi, fructiferi usque ad 10 cm. longi, longipilosi; pedicelli densius vestiti, 2–3 cm. longi. *Bracteolæ* lanceolatæ acuminatæ, 13 mm. longæ, 3·5 mm. latæ, membranaceæ, utrinque molliter extra densius tomentellæ, gemmas superantes. *Sepala* lanceolata, 15–17 mm. longa, 3·5–4 mm. lata, extra dense breviter tomentosa, intus glabra. *Petala* satis obliqua, 2 cm. longa, 1·5–2 cm. lata. *Stamina* perfecta 15, staminodiis 5 inter triades staminum interjectis; triadis stamen medium lateralibus brevius; tubus staminalis vix 2 mm. altus; filamenta libera 2–3·5 mm. longa; antheræ lineares 3–4 mm. longæ; staminodia 10–13 mm. longa, 0·75 mm. lata. *Ovarium* 5- vel 7-loculare, 5 mm. diametro, extra dense tomentosum; stylus communis vix ultra 4 mm. longus, ultra medium vel usque furcam tomentosus, ramis loculis isomeris, 6 mm. longis, valde revolutis, externe glabris; loculi intus stellato-pilosi, usque 9-ovulati. *Capsula* 10–13 mm. longa, 5–6 mm. diametro transverso, loculis 1-spermis, ovulis abortivis persistentibus.

Buddu District, on hills, Masaka, *Dawe*, 10.

Dombeya Mukole, *Sprague*, sp. nov. (§ Xeropetalum); *D. umbraculiferæ*, K. Schum., habitu simillima, pedicellis pilis stellatis tantum indutis, alabastris rotundatis, sepalis 6–7-nerviis haud acuminatis, ovario longe tomentoso ab ea recedit.

Arbor usque ad 20 m. alta. *Ramuli* 3–5 mm. diametro, striato-rugulosi, purpureo-fusci, puberuli. *Petioli* semiteretes, pilis stellatis caducis pubescentes, 1–4 cm. longi. *Lamina* late ovata, breviter acutiuscule acuminata, basi cordata, 5–10 cm. longa, 3–7 cm. lata, crenato-serrata, supra sublævis minute stellatim puberula, venis inconspicuis pubescentibus, subtus stellatim pubescens, venis et rete denso venularum prominentibus, basi sub-7-venia, venis lateralibus cæteris utrinque 4–6. *Stipulæ* lanceolatæ, acuminatæ, 6–7 mm. longæ, 1·5 mm. latæ, utrinque dense pubescentes. *Pedunculi* axillares, 3–6 cm. longi, stellato-pubescentes; pedicelli 0·5–1 cm. longi, longius et densius pubescentes; bracteolæ lineares, 1·5–2 mm. longæ, stellato-pilosæ, caducissimæ. *Sepala* oblongo-lanceolata, acutiuscula, 4·5–5 mm. longa, 1·2–1·8 mm. lata, extra stellato-tomentella, intus glabra, 6–7-venia. *Petala* valde obliqua, 8·5–9 mm. longa, 4–4·5 mm. lata. *Stamina* perfecta 15, staminodiis 5 inter triades staminum interjectis; triadis stamen medium lateralibus brevius; tubus staminalis vix 0·5 mm. longus; filamenta libera 2–3·5 mm. longa; antheræ oblongæ, circa 1 mm. longæ; staminodia 6–7 mm. longa, fere filiformia. *Ovarium* 3-loculare, depresso-globosum, 1 mm. altum, 1·5 mm. diametro (pilis inclusis 1·5 mm. altum, 2 mm. diametro), longe albido-tomentosum; loculo biovulati; stylus 2–2·5 mm. longus, inferne pilosus.

Budongo Forest, *Dawe*, 831; Mabira Forest, *Dawe*, 182; Koki District, *Dawe*, 394. Native name, "Mukole."

TILIACEÆ.

Grewia ugandensis, *Sprague*, sp. nov.

Frutex ramulis fere perfecte teretibus, novellis aspere ferrugineo-stellato-tomentellis, senioribus pilorum basibus persistentibus punctatis, leviter undulato-striolatis, ultimis patentibus vel patulis. *Petiolus* supra applanatus, 5–10 mm. longus, aspere tomentellus. *Lamina* elliptico-ovata vel elliptica, apice breviter acutiuscule acuminata, basi leviter cordata vel rotundata, 6–11 cm. longa, 3·5–6 cm. lata, integra, margine paullo reflexo et subundulato, tenuiter coriacea, supra vix nitidula, viridi-fusca, venis leviter impressis, venularum rete minutissimo densissimo inconspicuo, subtus venis et venulis prominentibus satis dense reticulata, indumento sordide fulvo-argenteo pilorum minutorum stellatorum creberrime intertextorum ope lentis validi tantum visorum; venæ basales tres (marginali crenata exclusa), quarum duæ laterales ultra medium laminæ attingunt; venæ laterales cæteræ utrinque quatuor arcuatim ascendentes in marginalem transientes. *Inflorescentia* terminalis et axillaris; rhachis angulato-flexuosa, ut pedicelli ferrugineo-tomentella; pedicelli 1–1·5 mm. longi. *Sepala* 5, induplicato-valvata, spathulato-cucullata, 5–6 mm. longa, 1·5–2 mm. lata, extra tomentella, intus pubescentia. *Petala* 5, late ovata, acute acuminata, vix 2 mm. longa ungue minuto incluso, intus basi glandulam papillosam transverse ellipticam circa 0·5 mm. longam 0·75 mm. latam gerentia, marginibus extra et acumine utrinque glabriusculis, cæterum dense pilosa. *Androgynophorum* glabrum, 0·75 mm. longum. *Stamina* circa 30, intra annulum pilosum inserta; filamenta glabra, 2·5–3 mm. longa; antheræ orbiculari-reniformes, vix 0·5 mm. diametro. *Ovarium* triloculare, globosum, 1–1·5 mm. diametro, tomentosum, stylo 2–3 mm. longo inferne piloso cæterum glabro, loculis 4-ovulatis, ovulis angulo interno horizontaliter affixis.

Unyoro, *Dawe*, 918.

Triumfetta ruwenzoriensis, *Sprague*; similis *T. macrophyllæ*, K. Schum., a qua staminibus paucioribus et indumento recedit.

Frutex 1–2·5 m. altus. *Ramuli* obtuse angulati, vix undulati, circa 5 mm. diametro, minute striolati et stellatim puberuli, superne stellatim pubescentes. *Petioli* 2–3·5 cm. longi, stellatim pubescentes, supra canaliculati, pilis longioribus simplicibus ornati. *Lamina* ambitu ovata vel sæpius suborbicularis, interdum leviter trilobata, 6–8·5 cm. longa, 3–6·5 cm. lata, subacuta, dupliciter obtuse serrata, basi 5–7-venia, utrinque scabrida, supra pilis minutis stellatis et paucis longioribus simplicibus puberula, subtus pubescens (novella subtus tomentella); venæ supra prominulæ subtus prominentes, laterales utrinque circa 3 (basalibus exceptis); venulæ supra inconspicuæ, subtus prominulæ. *Stipulæ* e basi lata arcuato-subulatæ, circa 1 cm. longæ, basi 2–2·5 mm. latæ, stellatim ciliatæ. *Pedunculi* 5–7 mm. longi, dense pubescentes. *Flores* 4–5 una involucrati, bracteis subulato-linearibus circa 4 mm. longis, 0·75 mm. latis, pedicellis circa 3 mm. longis. *Sepala* 5, linearia, 13·5 mm. longa, supra medium 1–1·25 mm. lata, apice cucullata appendiculata, basi per 2 mm. ampliata, dense ciliata, 1·5–2 mm. lata, extra stellatim pubescentia, intus glabra, appendicula 0·5 mm. longa. *Petala* 5, oblongo-lanceolata, rotundata, 10·5–11·5 mm. longa, 2·75–3 mm. lata, basi per 1·5 mm. dense ciliata, pilis extra affixis. *Androgynophorum* 0·5–0·75 mm. longum, glabrum, glandulis transverse ellipticis circa 0·4 mm. longis, 0·75 mm. latis. *Discus* extrastaminalis vix 0·5 mm. altus, dense longiuscule ciliatus. *Stamina* 10 (–11), alterne inæqualia; filamenta 9–11 mm. longa; antheræ 1–1·25 mm. longæ. *Ovarium* depresso-globosum, vix 1 mm. diametro, 5-loculare; stylus circa 10 mm. longus, filamenta longiora subæquans. *Capsula* globosa, glabra, corpore 4–5 mm. diametro, aculeis uncinatis 7–8 mm. longis.

Ruwenzori Mountain, 1800 m., *Dawe*, 657.

RUTACEÆ.

BALSAMOCITRUS, *Stapf* (gen. nov.).

Æglæ affinis, habitu, foliis crassis, imprimis staminibus paucis definitis et seminum testa glaberrima distincta.

Flores hermaphroditi. *Calyx* parvus, 5-partitus, diu persistens. *Petala* 5, oblonga, imbricata. *Stamina* 10; filamenta subulata, antheris sagittatis longiora, disco annulari insidentia. *Ovarium* ovoideum, 8-loculare; stylus brevis, conico-cylindricus, mox deciduus; stigma inconspicuum, vix sulcatum; ovula in loculis ∞, 2-seriata. *Bacca* ovoideo-globosa, corticeo ligneo, 8-locularis, loculis polyspermis muco liquido balsameo repletis, pulpa parca. *Semina* subellipsoidea, leviter compressa, testa coriacea, glaberrima; endosperma nullum. *Embryo* cotyledonibus amplis crassis carnosis, radicula minuta.—*Arbor* inermis, alta. *Folia* 3-foliata, foliolis crassis coriaceis subcrenulatis pellucido-punctatis. *Paniculæ* axillares, breves, floribus parvulis. *Bacca* magna.

Species unica.

Balsamocitrus Dawei, *Stapf*, sp. nov. (Pl. 22.)

Arbor circiter 20 m. alta, glaberrima. *Rami* crassiusculi, exsiccando nigricantes, juniores fistulosi. *Foliola* æqualia, ovata vel elliptico-ovata, obtusiuscula vel subacuminata, basi acuta crenulata, 4–7 cm. longa, 3·5–5 cm. lata, exsiccando fuscescentia, nigropunctata; petioluli laterales 7–10 mm. longi, intermedius ad 15 mm. longus; petiolus communis 2·5–3 cm. longus. *Paniculæ* 2–4 cm. longæ, contractæ; bracteæ minimæ; pedicelli demum ad 4 mm. longi, crassiusculi. *Calyx* ad 2 mm. longus, segmentis late ovatis acutis crassiusculis. *Petala* alba, 5 mm. longa. *Filamenta* 2 mm. (vel paulo ultra) longa; antheræ vix 1·5 mm. longæ. *Fructus* ad 13 cm. longus, 11 cm. latus, cortice 5 mm. crasso. *Semina* ad 16 mm. longa, 10 mm. lata, 8 mm. crassa.

Unyoro, Budongo Forest, *Dawe*, 788.

SIMARUBACEÆ.

Odyendyea longipes, *Sprague*, sp. nov.; a duabus speciebus hactenus descriptis petiolulis pluries longioribus recedit.

Arbor 18–21 m. alta. *Ramulus* unicus exstans sinuosus, subangulatus, cortice fusco striolato. *Folia* 5-juga, foliolo terminali; petiolus supra late excavatus, 5–7 cm. longus, basi 4–5 mm. latus; rhachis internodia 1·7–2·5 cm. longa; petioluli supra valde canaliculati, 1–1·5 cm. longi; foliola elliptico-oblonga, apice acutiuscule acuminata, basi obtusa, 5–10 cm. longa, 3·5–4 cm. lata, integra, margine vix undulato levissime reflexo, rigide coriacea, supra sublævia, subtus minute rugulosa, costa supra propter colorem fuscum distincta subtus prominente, venis lateralibus supra inconspicuis subtus magis obviis, venulis occultis. *Panicula* terminalis et axillaris, corymbosa; rhachis angulata, costata; rami arcuatim ascendentes, paribus ramulorum 3–5 decussatis, vel ramulis alternis; pedicelli quadrangulares, leviter sulcati, 3–4 mm. longi. *Calyx* circa 2·5 mm. longus; lobi 5 elliptico-orbiculares, 1·5–2 mm. longi, sæpius in paria usque 1 mm. infra apicem connati. *Petala* 5 ovato-oblonga vel oblonga, obtusa, interdum brevissime acuminata, 7 mm. longa 2·5–3 mm. lata, extra dense minute pubescentia, intus dense tomentella. *Stamina* 10; filamenta 5-6 mm. longa, intus medio vel infra medium appendice dense villosa; antheræ elliptico-oblongæ, 1 mm. longæ. *Discus* subcylindricus, 1 mm. altus, circa 1·5 mm. diametro, 10-sulcatus, apice concavus. *Ovarii* segmenta 5, 0·75 mm. longa, vix 0·5 mm. lata; styli ea subæquantes fere ad apicem connata, inferne dense pilosa.

Toro, 1300 m., *Dawe*, 458.

Balanites Wilsoniana, *Dawe et Sprague*, sp. nov.; fructuum et foliolorum magnitude insignis.

Arbor 12–27 m. alta, cortice viridi-griseo, statu juvenili spinosa. *Rami* teretes, nigro-virides, glabri, juniores striati nitiduli. *Folia* 2-foliolata; petiolus 1–2 cm. longus, supra canaliculatus; foliola elliptico-ovata, acute acuminata, basi rotundata vel subcuneata, 7–9 cm. longa, 4–6 cm. lata (juvenilia lanceolata, circa 2·5 cm. lata), coriacea, glabra, opaca, venis lateralibus utrinque circa 8 ascendentibus, supra inconspicuis, subtus prominulis, costa subtus prominente; petioluli 0·5–1 cm. longi, conspicue canaliculati. *Spinæ* 0·5–1 cm. supra axillas ortæ, plerumque bifurcæ, crure majore usque 8 cm. longo. *Drupa* juvenilis subcylindrica, apicem et basin versus paullo angustata, quinquesulcata, circa 7 cm. longa, 2–2·5 cm. crassa, matura ellipsoidea, 7–8 cm. longa, 5·5–6·5 cm. crassa; epicarpium circa 3 mm. crassum, carnosum, extra subcrustaceum, vittis 5 longitudinalibus, inter vittis lenticellis longitudinaliter elongatis dense obtectum; mesocarpium e fibris in pulpa nidulantibus compositum, resinæ redolens; endocarpium lignosum, circa 7–8 mm. crassum. *Semina* crasse fusiformia, longitudinaliter sulcata, 4·5 cm. longa, 2·5 cm. crassa, testa crustacea pulverulenta.

Toro: Kibale Forest, *Dawe*, 511; also found in Unyoro and Semliki Forests. Native name, "Lukauyu."

[The fruits of this tree are much sought after by elephants, who are mainly responsible for its distribution, the seed passing through the animals undigested. I have frequently seen clumps of seedlings which have come up in elephants' droppings. The seed affords an oil used as an unguent by the Baamba people of Semliki Forests, who also use the seed for food.—M. T. D.]

The bifurcation of the supra-axillary spines is due to the main axis of the spine being bent to one side by the almost equally vigorous growth of a lateral branch, which is borne in the axil of a minute scale-leaf. A single young spine on Dawe's specimen has two lateral branches. Kirk's Rovuma River specimen, mentioned by Oliver, Fl. Trop. Afr. i. 315, has forked spines of the same nature, and is undoubtedly a new species allied to *Balanites Wilsoniana*; the material is, however, insufficient for description.—T. A. S.

MELIACEÆ.

Carapa grandiflora, *Sprague*, sp. nov.; florum magnitudine localisque biovulatis a speciebus pentameris cæteris recedit.

Arbor glabra, ramulis subangulatis striolatis lenticellosis pallide fuscis, circa 7–10 mm. diametro. *Folium* unicum exstans 5-jugum; petiolus plano-convexus, 14 cm. longus, basi ultra 5 mm. latus, striolatus, densiuscule lenticellosus, pallide fuscus; internodia rhachis 4–5 cm. longa, petiolo similia; petioluli 6–7 mm. longi, supra canaliculati; foliola elliptico-oblonga, apice rotundata, basi obtusissima paullo inæquilateralia, 10–20 cm. longa, 6–9 cm. lata, integra, margine reflexo leviter undulato, supra pallide subglauco-viridia, venis lateralibus et costa leviter prominentibus, venulis inconspicuis, subtus pallide brunnea, venis lateralibus leviter costa conspicue prominentibus, rete venularum densissimo satis manifesto; venæ laterales utrinque 7–11, arcuatim ascendentes, marginem fere attingentes. *Paniculæ* circa 4 apices versus ramulorum in axillis foliorum minorum delapsorum ortæ, pyramidales, 10–27 cm. longæ; rhachis conspicue compresso-quadrangularis, fusca, conspicue lenticellosa; bracteæ ovato-deltoideæ, convexæ, inferiores 3 mm., ultimæ 1 mm. longæ; pedicelli 4–5 mm. longi, quadrangulares, sulcati. *Sepala* 5, semicircularia (vel latissime ovata), 1·5–2 mm. longa, 2–2·5 mm. lata, breviter ciliata, cæterum glabra. *Petala* 5, late elliptica, valde concava, 6–8 mm. longa, 5–6 mm. lata (explanata), glabra. *Tubus staminalis* circa 4 mm. longus; lobi 10, ovato-oblongi, rotundati, 1–1·5 mm. longi, basi 1 mm. lati; antheræ in incisuris sessiles, breviter oblongæ, circa 0·75 mm. longæ. *Discus* 1 mm. altus, rugulosus, supra crenulatus. *Ovarium* late ovoideum, 2 mm. longum, 1·75 mm. diametro, 5-loculare, glabrum; stylus crassus, circa 0·5 mm. longus; stigma discoideum, 1·5 mm. diametro, margine reflexo crenulato; ovula pro loculo 2. *Capsula* depresso-globosa, unica exstans trisperma, 8 cm. longa, 10 cm. crassa; valvæ medio leviter longitudinaliter depressæ. *Semina* usque ad 7 cm. longa et lata, usque 4 cm. crassa.

West Ankole Forest, 1500 m., *Dawe*, 351.

Lovoa budongensis, *Sprague*, sp. nov.; ab *L. trichilioide*, Harms, antheris apiculatis recedit.

Arbor alta. *Ramulus* unicus exstans teres, striolatus, lenticellosus, fuscus, circa 8 mm. diametro. *Folia* 5–7-juga, 20–45 cm. longa, glabra; petiolus 4–9 cm. longus, medio 3–5 mm. latus, plano-convexus, margine superiore anguste alatus; petioluli canaliculati, 3–4 mm. longi; foliola oblonga vel ovato-oblonga, apice breviuscule obtuse acuminata vel retusa, basi obtusa, 5–12 cm. longa, 2·5–5 cm. lata, supra nitidula, subtus opaca; venæ laterales utrinque 12–15, subtus ut venulæ magis prominentes. *Paniculæ* axillares, cymosæ, pyramidales, 20–30 cm. longæ, rhachei acute angulata ramis alternis ascendentibus, ramulis pluries trichotomis. *Pedicelli* compressi, 1·5–2 mm. longi, 1 mm. infra apicem articulati. *Sepala* 4, semicircularia vel suborbicularia, ciliata, 1–1·5 mm. longa, circa 2 mm. lata. *Petala* 4, elliptico-obovata, 6 mm. longa, circa 3·5 mm. lata (explanata), valde concava. *Tubus staminalis* decemcrenulatus, crenulis antheris alternantibus, 3 mm. longus; antheræ 8, subsessiles, oblongæ, apiculatæ, vix ultra 1 mm. longæ. *Discus* conspicuus, vix ultra 1 mm. diametro. *Pistillum* 3 mm. longum; ovarium 4-loculare, in stylum æquilongum angustatum; stigma capitatum, vix ultra 0·5 mm. diametro.

Budongo Forest, *Dawe*, 808.

Lovoa brachysiphon, *Sprague*, sp. nov.; ab *L. budongensi*, Sprague, tubo staminali subtruncato facile distinguitur.

Arbor 15–21 m. alta. *Ramulus* unicus exstans teres, leviter striolatus, circa 6 mm. diametro, glaber, fuscus, lenticellis inconspicuis. *Folia* 3–5-juga, 25–30 cm. longa, glabra; petiolus 5–6 cm. longus, medio 3–4 mm. latus, ei *L. budongensis* conformis; petioluli canaliculati, 5–8 mm. longi; foliola oblonga, breviter obtusissime acuminata, basi obtusa, 6–13 cm. longa, 2·5–5·5 cm. lata, supra nitida, subtus opaca; venæ utroque latere costæ 10–14, utrinque prominentes. *Panicula* terminalis, corymbosa, circa 25 cm. longa et paullo latior, rhachei obtusiuscule angulata, ramis alternis subarcuatim ascendentibus, ramulis pluries trichotomis. *Pedicelli* compressi, circa 1 mm. longi. *Sepala* 4, semicircularia vel suborbicularia, 1 mm. longa, vix 2 mm. lata, valde concava, minute ciliata. *Petala* 4, late obovata, valde concava, 5 mm. longa, 3·5–4 mm. lata (explanata). *Tubus staminalis* subtruncatus, inter antheras vix undulatus, 2–2·5 mm. longus; antheræ 8, subsessiles, ovato-oblongæ, 1 mm. longæ, apiculatæ. *Discus* brevis, paullo ultra 1 mm. diametro. *Pistillum* 2–2·5 mm. longum; ovarium 4-loculare, in stylum æquilongum angustatum; stigma capitatum, circa 0·5 mm. diametro.

Toro District, 1500 m., *Dawe*, 457.

Lovoa Brownii, *Sprague*, sp. nov.; ab *L. brachysiphone*, Sprague, foliolis minoribus et forma petalorum recedit.

Arbor circa 18 m. alta. *Ramuli* teretes, striolati, 4–7 mm. diametro, conspicue lenticellosi, glabri, fusci. *Folia* 3–5-juga, 12–18 cm. longa, glabra; petiolus 3–6 cm. longus, medio 2–3 mm. latus, ei *L. budongensis* conformis; petioluli canaliculati, 3–6 mm. longi; foliola oblongo-lanceolata, breviter obtusissime vel retuse acuminata, basi inæqualiter cuneata, 4–7 cm. longa, 1–2·5 cm. lata, supra nitidula, subtus opaca; venæ utroque latere costæ circa 16, supra haud conspicuæ, subtus ut venulæ prominulæ. *Panicula* terminalis et axillaris, 20–30 cm. longa, rhachei acutiuscule angulata, ramis alternis subarcuatim ascendentibus, ramulis pluries trichotomis. *Pedicelli* compressi, circa 2 mm. longi, 1 mm. infra apicem articulati. *Sepala* 4, semicircularia vel suborbicularia, 0·75–1 mm. longa, circa 1·5 mm. lata, ciliata. *Petala* 4, elliptico-oblonga, 6 mm. longa, circa 3 mm. lata (explanata), valde concava. *Tubus staminalis* subtruncatus, 2·5–3 mm. longus; antheræ subsessiles, obtuse sagittatæ, 0·75–1 mm. longæ, inconspicue apiculatæ. *Discus* conspicuus. *Pistillum* 3·5 mm. longum; ovarium 4-loculare in stylum æquilongum angustatum; stigma capitatum, vix ultra 0·5 mm. diametro.

Entebbe, 1100 m., *E. Brown*, 243.

Lovoa Klaineana (*Pierre MSS.*), *Sprague*; a cæteris speciebus foliolis obovatis magnis supra haud nitidulis recedit.

Arbor 35–40 m. alta. *Ramuli* flexuosi, teretes, circa 1 cm. diametro, lenticellis crebris rugulosi, glabri, pallide fusci. *Folia* 5–6-juga, 20–40 cm. longa, glabra; petiolus 4–8 cm. longus, angustissime alatus; petioluli canaliculati, 5–10 mm. longi; foliola obovata vel oblongo-obovata, rotundata vel breviter obtusissime acuminata, basi obtuse æqualiter cuneata, 8–22 cm. longa, 3·5–10 cm. lata (novellis exclusis), utrinque opaca fusca, margine reflexo; venæ utroque latere costæ numerosæ, supra inconspicuæ, subtus prominentes. *Paniculæ* terminales et axillares, usque ad 35 cm. longæ, rhachei acute angulata, ramis alternis stricte ascendentibus, ramulis pluries trichotomis. *Pedicelli* compressi, vix 1 mm. infra apicem articulati. *Sepala* 4, semicircularia, circa 1 mm. longa, 1·75 mm. lata, ciliolata. *Petala* 4, patentia tandem reflexa, obovato- vel elliptico-oblonga, 4·5–5 mm. longa, 2–2·5 mm. lata (explanata). *Tubus staminalis* fere truncatus, 2·5–2·75 mm. longas, filamentellis circa 0·4 mm. longis; antheræ lineari-oblongæ, apiculatæ, 0·75 mm. longæ. *Discus* conspicuus. *Pistillum* circa 3·5 mm. longum; ovarium 4-loculare, vix 1·5 mm. longum, stylo brevius; stigma capitatum, vix 0·5 mm. diametro. *Capsula* septifraga, tetragona, utrinque paullo angustata, et rotundata, 5–6 cm. longa, 1–1·3 cm. crassa; valvæ 4, rigide coriaceæ, extra obscure fuscæ, intus subcinnamomeæ; columna solemniter tetragona, spongiosa, basi impressionibus 1 vel 2 nucleorum seminum. *Semina* 3·5–4·5 cm. longa, ala superiore circa 1 cm. lata. *Cotyledones* plano-convexæ, oblique ellipticæ, 12–14 mm. longæ, 8–9 mm. latæ; radicula lateraliter 4–5 mm. infra apicem inserta, usque 2 mm. longa, 1 mm. lata.

WEST TROPICAL AFRICA: Gaboon Region, *Klaine*, 1440.

The genus *Lovoa* was described by Harms from flowering material only, and until the fruits of *L. trichilioides*, Harms, are known, the generic identity of the Uganda and Gaboon species above described must remain a little doubtful.—T. A. S.

PSEUDOCEDRELA, *Harms, in Engl. Bot. Jahrb.* xxii. (1895) 153.

Key to the Species.

Capsule under 9 cm. long; seeds up to 4·5 cm. long; cotyledons broadly obovate .... 1. *P. Kotschyi*, Harms.

Capsule 15–25 cm. long; seeds 7·5–12·5 cm. long; cotyledons ovate or elliptic.

  Capsule cylindric; column produced 2 cm. above the uppermost seeds; cotyledons elliptic. 2. *P. excelsa*, sp. nov.

  Capsule shortly clavate; column scarcely produced above the uppermost seeds; cotyledons broadly and obliquely ovate .... 3. *P. utilis*, sp. nov.

Further characters separating *P. excelsa* and *P. utilis* from

P. Kotschyi are the entire leaflets and the absence of the fibrous network connecting the valves after dehiscence.

Pseudocedrela excelsa, *Dawe et Sprague*, sp. nov.

Arbor usque 30 m. alta, cortice crasso, interiore rubido-carneo. *Rami* robusti, apice 2·5–5 cm. diametro. *Folia* circa 1 m. longa, circa 10-juga, rhachei terete lignosa lenticellosa, basi 7 mm. diametro; foliola elliptico-oblonga, brevissime acuminata, basi cuneata, 15–25 cm. longa, 7–9·5 cm. lata, integra, subcoriacea, glabra, opaca, venis lateralibus utrinque 11–15, supra interdum leviter impressis, subtus ut vena media prominentibus, venulis reticulatis subtus magis obviis; petioluli 6–10 mm. longi. *Flores* desunt. *Capsula* cylindrica, usque ad 25 cm. longa; valvæ 2–2·3 cm. latæ, 2–3 mm. crassæ, utrinque attenuatæ, extra obscuræ, lenticellis parvis elongatis, intus nitidulæ, æquabiliter coloratæ, seminum impressionibus notatæ; columna supra semina summa circa 2 cm. producta, basi obtusa. Semina 7·5–12·5 cm. longa, 1·3–1·7 cm. lata; cotyledones ellipticæ, 2·2 cm. longæ, 1·3–1·4 cm. latæ.

West Ankole Forest, 1500 m., *Dawe*, 358.

P. utilis, *Dawe et Sprague*, sp. nov.

Arbor circa 30 m. alta, 1–1·5 m. diametro, cortice griseo, interiore rubido-carneo. *Ramuli* apice 1–1·3 cm. diametro, castaneo-pubescentes. *Folia* 30–60 cm. longa, 8–11-juga, rhachei lateribus canaliculata supra breviter dense cinereo-pubescente subtus brunneo-pubescente; foliola leviter falcata, oblonga, inferiora ovato-oblonga vel ovata, 4·5–10 cm. longa, 2–3 cm. lata, breviter obtuse acuminata, basi oblique rotundata, supra nitidula, vena media ± cinereo-pubescente, venulis conspicue reticulatis, subtus opaca, vena media brunneo-pubescente, fasciculis pilorum in axillis venarum lateralium puberularum, cæterum glabra; venæ laterales utrinque 10–15, regulares; petioluli 1–2 mm. longi. *Flores* desunt. *Capsula* pedunculo robusto 15–25 cm. longo, breviter clavata, 20–25 cm. longa, 15–18 cm. ambitu; valvæ apice acutæ incurvæ, basin versus sensim angustatæ, 2·3–2·5 cm. latæ, 4–6 mm. crassæ, extra obscuræ lenticellis magnis circularibus vel ellipticis, intus nitidulæ, colore obscuriore variegatæ, seminum impressionibus vix visis; columna semina suprema vix superans. Semina 7·5–10 longa, circa 2 cm. lata; cotyledones late oblique ovatæ, 1·7–1·8 cm. longæ, 1·4 cm. latæ.

Budongo Forest, *Dawe*, 786.

MELIANTHACEÆ.

Bersama ugandensis, *Sprague*, sp. nov.; a *B. maxima*, Baker, staminibus duobus anticis liberis, petalis angustioribus minus crassis, ovario longius densius tomentoso, stylo graciliore recedit.

Arbor 12 m. alta. *Ramuli* superne obtuse angulati, sericeo-tomentosi. *Folia* circa 40 cm. longa, 15–17-foliolata; petioli semiteretes, fulvo-tomentosi, supra canaliculati, 5–8 cm. longi; rhachis præsertim inter foliola superiora attenuatim oblanceolato-alata, supra glabra vena media pubescente vel puberula excepta, subtus et ad nodos tomentosa; foliola subsessilia, superiora oblonga, inferiora ovato-oblonga, infima late ovata, apice breviuscule acute acuminata, basi rotundata vel obtusissima, supra subfusca glabra, vena media leviter impressa, cæteris haud conspicuis, subtus dense pubescentia vel tomentosa, venis lateralibus magis obviis; venæ laterales utrinque 9–13, patulæ, prope marginem arcuatim anastomosantes. *Stipulæ* lineari-subulatæ, 1·5–2 cm. longæ, circa 2 mm. latæ, extra villoso-tomentosæ, intus glabræ. *Racemus* circa 25 cm. longus, rhachei sulcata dense longiuscule pubescente; bracteæ filiformes, circa 5 mm. longæ, dense pilosæ. *Pedicelli* 7–8 mm. longi, ut calyx longe tomentosi. *Calyx* extra tomentosus, intus glabriusculus; lobi 4, late ovati; anticus apice bifidus, 5 mm. longus, 4·5 mm. latus; laterales et postici 4 mm. longi, 3 mm. lati. *Petala* reflexa, extra basi excepta tomentosa, intus inferne glabriuscula, superne dense pubescentia; anticum lineari-spathulatum, 17–18 mm. longum, 2·5 mm. latum; lateralia spathulata, 16 mm. longa, 3·5 mm. lata; postica oblongo-spathulata, 14–15 mm. longa, 3·5–4 mm. lata. *Filamenta* sparsiuscule pilosa, antica libera, 16–18 mm. longa, postica 14–15 mm. longa, 4 mm. connata; antheræ vix 4 mm. longæ, 1·75 mm. latæ, sparse pilosæ. *Discus* posticus, carnosus, 1 mm. altus. *Ovarium* compresso-ovoideum, 3·5–4 mm. longum, 2·5 mm. latum, dense tomentosum; stylus 6 mm. longus, fere usque ad apicem pilosus; stigma globosum, 1–1·5 mm. diametro.

Koki District, 1200 m., *Dawe*, 382.

Flowers of *B. ugandensis* were found in which the filaments of three or of all four stamens were short (8–9 mm. long), thick, and densely tomentose; the anthers were slightly broader (2 mm. broad) than in the normal flowers; both ovary and disc were larger than in normal flowers, and the disc was densely tomentose instead of being glabrous.

LEGUMINOSÆ.

Acacia prorsispinula, *Stapf*, sp. nov.; *A. macrothyrsæ*, Harms, affinis, sed foliorum ad 12-pinn., foliolorum ad 30-jug., spinis stipulaceis minoribus prorsus directis, capitulis longius pedunculatis, corollis cylindricis, ovario circiter 9-ovulatis distincta.

Arbor 4·5–6 m. alta, glaberrima, ramis cortice brunneo-fusco tectis. *Folia* circiter 12-pinnata; rhachis gracilis, 20–24 cm. longa, supra vix canaliculata, in dorso et ad latera angulata, ad basin glandula orbiculari 3 mm. diametro munita; pinnæ 9–15 cm. longæ, infimæ 2½–3 cm. supra basin ortæ, rhachilla acute tetragona; foliola ad 60 lineari-lanceolata, obliqua, acuta vel subacuta, basi latere postico obtuse auriculata, 9–11 mm. longa, 2 mm. lata, subcoriacea, nervis 2 subparallelis postico margine proximo obscuro; stipulæ spinescentes, spinæ breves, prope paniculam 1 mm. longæ vel vix ullæ, omnes prorsus directæ. *Panicula* ampla, 20 cm. longa lataque, ramis rigidis subdivaricatis uti rhacheos parte superiore ancipitibus; bracteæ ramorum minutæ, ovatæ, acutæ; pedunculi 3–2-ni vel solitarii, ad 2 cm. longi, nonnulli brevissimi, ad medium bracteati; bracteæ pedunculorum in cupulam 4-dentatam connatæ. *Capitula* 6 mm. diametro, lutea, odorata; bracteolæ spatulatæ, quam flores breviores. *Calyx* turbinatus, 1 mm. altus, 5-crenatus, crenis incrassatis puberulis. *Corolla* cylindrica, 2·5 mm. longa, 5-dentata, dentibus 0·5 mm. longis ovatis subacutis incrassatis. *Stamina* perplurima; filamenta ad 6 mm. longa, ima basi magis minusve connata; antheræ depresso-globosæ, 0·15 mm. longæ, connectivo apice glandula globosa 0·15 mm. diametro stipitata instructo. *Ovarium* ambitu oblique oblongum, 9-ovulare. *Legumen* stipitatum, oblongum, complanatum, obtusum vel cuspidatum, ad 10 cm. longum (stipite 1–1·5 cm. longo), 2 cm. latum, coriaceum, tenuiter venosum. *Semina* ad 9, nummulariiformia, ad 1 cm. diam.

Acholi, *Dawe*, 856; Nandi Country, Sibu, *Evan James*.

A very similar plant was collected by Dr. T. G. Nicholson in Northern Nyasaland, on the Upper Luangwa River (at 3000 ft.). The specimen is, however, too incomplete for exact identification.

ROSACEÆ.

Alchemilla ruwenzoriensis, *Rolfe*; fruticulus insignis, ab *A. argyrophyllo,* Oliver, foliis flabellatis 5-lobis multo majoribus distincta.

"*Fruticulus* diffusus" (*Dawe*). *Rami* ramosi, sericeo-villosi, breves. *Folia* petiolata, flabellata, sericeo-strigosa, 2·5–4·5 cm. lata, 5-loba, rarius 3-loba, lobis obovatis sæpissime inciso-dentatis; petioli 5–10 mm. longi; stipulæ oblongo-lanceolatæ, acutæ, membranaceæ, brunneæ, ciliatæ, 8–20 mm. longæ. *Cymæ* axillares, breves, circa 2 cm. longæ, vaginis brunneis obtectæ, paucifloræ. *Flores* pedicellati. *Calycis* tubus turbinatus, 2 mm. longus; lobi triangulari-ovati, acuminati, 2–3 mm. longi, cum tubo sericeo-strigosi.

Ruwenzori, on rocks at 3600 m., *Scott Elliot*, 8109; at 3000–3900 m., *Doggett*; at 3000–3300 m., *Dawe*, 613.

Mr. Dawe remarks that this is a shrub with silver foliage, which grows on mossy banks, and spreads over large areas, forming a most interesting part of the vegetation at 3000 to 3300 m. Mr. Scott Elliot's piece alone is in flowering condition.

Alchemilla geranioides, *Rolfe*; ab *A. tenuicauli*, Hook. f., ramis brevioribus et robustis, foliis approximatis et breviter petiolatis facile distinguenda.

"*Herba* procumbens" (*Dawe*). *Rami* ramosi, villosi, basi lignosi, internodiis brevibus. *Folia* petiolata, flabellata, breviter 5-loba, lobis brevibus latis inciso-dentatis, 1–1·5 cm. lata; supra sparse subtus dense pilosa; petioli villosi, 2–4 mm. longi; stipulæ late oblongæ, apice irregulariter inciso-dentatæ, basi vaginatæ membranaceæ. *Cymæ* axillares, breves, villosæ, paucifloræ. *Flores* brevissime pedicellati. *Calycis* tubus turbinatus, 2 mm. longus; lobi triangulari-ovati, acuti, 2 mm. longi, cum tubo villosi.

Ruwenzori, at 3300 m., on mossy bogs, *Dawe*, 678.

Rubus inedulis, *Rolfe*; ab *R. apetalo*, Poir., aculeis minus recurvis, paniculis laxioribus, pedicellis longioribus distinctus.

Frutex diffusus. *Ramuli* novelli dense pubescentes, adulti tomentosi, aculeis patentibus vel subrecurvis instructi. *Folia* imparipinnata, quinquefoliata vel interdum trifoliata; rhachis aculeata, pubescens; foliola breviter petiolata, late elliptica vel ovata, apiculata, inciso-dentata, 1–7 cm. longa, supra strigosa, subtus cinereo-tomentosa, venis pinnatis. *Paniculæ* terminales, laxæ, pubescentes et aculeatæ. *Pedicelli* graciles, 8–13 mm. longi. *Sepala* ovato-lanceolata, acuminata, dense cinereo-tomentosa, 5–6 mm. longa. *Petala* obovata, sepalis æquilonga. *Achænia* in dorso pilosa. "*Fructus* lutei, inedules" (*Brown*).

Buddu District at 1230 m. alt., *Brown*, 133. Koki District, at 1200 m. alt., *Dawe*, 388.

The fruits on both specimens appear to be in abnormal condition, the receptacle and achenes being swollen into a spongy densely tomentose mass, in some cases becoming densely villose, quite unlike the normal fruit of *Rubus*. It is suspected to be a galled condition, as no traces of fungi are present. Mr. Brown describes the fruit as yellow and inedible, but all those collected are in the same condition.

RHIZOPHORACEÆ.

Dactylopetalum ugandense, *Stapf*, sp. nov.; affinis *D. Mannii*, Hook. f., foliis magis coriaceis angustioribus nervatione diversa distinctum.

Arbor 20 m. alta vel altior, glaberrima; truncus cortice cinereo tectus ligno pallide brunneo. *Ramuli* juniores compressi, deinde teretes, exsiccando nigricantes, vetustiores cortice rudi fusco obtecti; gemmæ resina copiosa indutæ. *Folia* oblonga vel lanceolato-oblonga, rarius subelliptica, apice subacuta, basi acuta, integra vel obscure crenata, 5–11 cm. longa, 3–3·5 cm. lata, coriacea, exsiccando fuscescentia, nervo medio supra prominente, lateralibus utrinque circiter 9 nervo collectivo arcuato a margine 3–4 mm. remoto junctis uti reticulatione venarum subtus prominulis; petiolus 5–8 mm. longis, aurantiacus. *Flores* ad nodos fasciculati, subsessiles. *Calyx* 3 mm. longus, ultra ¼ 5-lobatus, lobis rotundatis. *Petala* 4 mm. longa, lineari-cuneata, ad ⅗ in fimbrias capillares flexuosis dissecta. *Discus* breviter tubularis, 0·75 mm. altus, integer. *Fructus* (immaturus) obovoideus, 5 mm. longus.

Toro: Kibale Forest, 1500 m., *Dawe*, 499.

Native name, "Kaubwa."

COMBRETACEÆ.

Terminalia Dawei, *Rolfe*; affinis *T. macropteræ,* Guill. et Perr., petiolis foliorum ad basin alatis, fructibus paullo latioribus distincta.

"*Arbor* parva" (*Dawe*). *Rami* subteretes, glabri. *Folia* obovato-oblonga, apiculata, ad basin in petiolum longe decurrentia, glabra, multicostata, minute reticulato-venosa, 2–3 dm. longa, 6–8 cm. lata. *Flores* ignoti. *Pedunculi* glabri, 3–4 cm. longi. *Fructus* breviter pedicellatus, elliptico-oblongus, compressus, late bialatus, apice retusus, glaber, circa 10 cm. longus, 4 cm. latus.

Acholi, *Dawe*, 865.

Native name, "Opank."

The species of this group, the section *Stenocarpæ* of Engler and Diels, are not easy to define. In general appearance the species here described most approaches the Senegambian *T. macroptera*, Guill. et Perr., but the remarkable extension of the lamina to the base of the petiole as a narrow wing, and the broader fruit-wing, leave no doubt of its distinctness. Unfortunately, flowering specimens were not obtained.

Terminalia Spekei, *Rolfe*; species facie *T. torulosæ*, Engl. et Diels, a qua differt foliis longioribus, fructibus latioribus.

"*Arbor* parva, 10–20 ft." (*Dawe*). *Rami* novelli cinereo-velutini, vetusti subglabri. *Folia* petiolata, elliptica vel elliptico-oblonga, subobtusa, multicostata, dense velutina, supra demum subglabra, venis impressis, subtus crebre reticulato-venosa, 15–32 cm. longa, 5–13 cm. lata; petioli 1·5–6 cm. longi. *Spicæ* axillares, dense velutinæ, densifloræ, 5–6 cm. longæ. *Bracteæ* deciduæ. *Perianthii* receptaculum inferius fusiforme, superius cupuliforme, cum disco longe et dense piloso, segmentis triangularibus acutis. *Stamina* 4–5 mm. longa. *Fructus* pedicellatus, elliptico-oblongus, late bialatus, omnino molliter tomentosus, apice obtusus vel apiculatus, circa 7 cm. longus, 3–3·5 cm. latus; pedicellus 1 cm. longus.—*Terminalia* sp., Speke, Nile Journ. p. 634; *T. macroptera,* Oliver, in Trans. Linn. Soc. xxix. (1873) p. 72 (non Guill. et Perr.).

Madi, on the Upper Nile, *Speke & Grant*, 643. Acholi Country, at 1050 m. alt., *Dawe*, 858.

Mr. Dawe collected both flowering and fruiting specimens,

and the latter are indistinguishable from those collected by Speke and Grant, hence they are provisionally referred to a single species, which is quite distinct from the Senegambian *T. macroptera*, Guill. et Perr. Col. Grant describes the species as a fine, large, handsome tree, 10 to 12 feet circumference of trunk, with the old bark hard, black, and fissured, and the young marbled red and grey, and the wood lemon-yellow and watery when fresh. The leaves grow in tufts from the tips of the branches. The kernel of the fruit eats as sweet as an almond. He further remarks that it is called " M'foof'oo," and that the natives use it for tinting their cloths (made of bark) a yellow colour, and that the Arabs make supports for their houses of its wood.

Terminalia velutina, *Rolfe*; a *T. glaucescente*, Planch., ramis et foliis cinereo-velutinis, fructibus non obtusis distinguenda.

"*Arbor* 9 m. alta." (*Brown*). *Rami* teretes, cinereo-velutini. *Folia* petiolata, elliptica vel elliptico-oblonga, acuta, multicostata, velutina, supra demum subglabra, venis impressis, subtus crebre reticulato-venosa; lamina 10–20 cm. longa, 5–8 cm. lata; petioli 3–5 cm. longi. *Spicæ* axillares, velutinæ, densifloræ, 6–9 cm. longæ. *Bracteæ* deciduæ. *Perianthii* receptaculum inferius fusiforme, superius cupuliforme, cum disco piloso; segmentis ovatis acutis. *Stamina* 3–4 mm. longa. *Fructus* pedicellatus, oblongus, subacutus vel apiculatus, bialatus, velutinus, 5–6 cm. longus, circa 15–18 mm. latus; pedicellus circa 8 mm. longus.

Busogo district, at 1170 m., *Brown*, 260; on open land throughout the Unyoro district, *Dawe*, 697.

Mr. Dawe remarks that the bark of this tree is boiled and used for tanning. Though markedly different from the Western species mentioned, the affinity between the two is very close, judging by the fruit. The section is a rather important one, but several of the species are still very imperfectly known, either flowers or fruit being wanting.

RUBIACEÆ.

Oldenlandia § **Conostomium**, *Stapf* (sect. nov.), a sectione *Kohautia* differt floribus axillaribus, corollæ tubo longissimo, ovario vertice conico producto, capsula costata apice dentibus 4 angustis dehiscente. Species duæ Africæ tropicæ.

Oldenlandia dolichantha, *Stapf*, sp. nov.; ab altera specie huius sectionis, *O. rotatæ*, Baker, foliis multo latioribus, corolla multo majore ore villosa distincta.

Herba annua, erecta, ad 40 cm. alta, plerumque glabra; caulis quadrangularis vel anguste quadrialatus, internodiis 1·5–4 cm. longis, ramis nonnullis evolutis ad vel ultra 15 cm. longis, aliis brevissimis ad foliorum angustorum fascicula redactis. *Folia* sessilia e basi lata rotundata lanceolata vel linearia et tunc interdum in petiolum attenuata, acuta, 2·5–6 cm. longa, 2–10 mm. lata, herbacea, patula vel deflexa, obscure nervosa; stipulæ ad commissuram brevem membranaceam parce fimbriatam redactæ. *Flores* axillares, sessiles, solitarii vel 2–3-nati in caulis dimidio superiore. *Receptaculum* turbinatum, 3 mm. longum. *Calyx* ad fere basin 4-partitus, segmentis lineari-subulatis 7–8 mm. longis. *Corolla* hypocrateriformis, alba; tubus tenuis, interdum ultra 10 cm. longus, medio vix 1 mm. diametro, sub limbo infundibuliformis et hic albo-papillosus, intus ore pilosus; lobi 4 lanceolati, acuminati, 9–10 mm. longi. *Antheræ* sub ipso ore sessiles, oblongæ, utrinque acutæ, 5–6 mm. longæ. *Ovarium* vertice conico; stigma clavatum, vix 2-lobum, exsertum. *Capsula* ellipsoideo-ovoidea, 4-costata, apice dentibus 4 angustis 1 mm. longis dehiscentibus. *Semina* numerosa, oblique ovoidea, sectione transversa obtuse 3-angulata vel fere orbiculari, lævissima, 0·6 mm. longa.

Nile Province, *Dawe*, 945.

This is a very remarkable plant. The affinity with *Oldenlandia rotata*, Baker, is quite evident; but a close examination of the genus *Oldenlandia* will probably result in the breaking up of the genus into several genera, one of which would be *Conostomium*. As it stands at present, it includes plants which differ considerably not only in general appearance, but more particularly in the structure of the fruits and seeds. The flowers of *O. rotata* are distinctly heterostylous. The corollas of the macrostylous form have a slightly larger limb with broader lobes and a very short funnel-shaped widening at the base, the stigma tips just reaching to where this widening begins, whilst the anthers surround the base of the slender stigmatic lobes. In the brachystylous form the stigma-tips are about 6 mm. below the mouth of the corolla-tube, which is scarcely widened and from which the upper half of the sessile anthers are exserted. On the other hand, all the flowers of *O. dolichantha* which I examined were alike and as described above.

Hymenodictyon scabrum, *Stapf*, sp. nov.; affinis *H. parvifolio*, Oliv., sed foliis scabris, fructibus paulo majoribus differt.

Frutex parvus; rami dense puberuli, demum glabrati, cortice brunneo parce lenticellato obtecti. *Folia* oblanceolata vel obovato-lanceolata, breviter acuminata, basi longe acuminata, 5–6 cm. longa, 2·5–3 cm. lata, papyracea, utrinque scabra, nervis utrinque circiter 5 perobliquis; petiolus 1–1·5 cm. longus. *Inflorescentia floresque* ignoti. *Infructescentia* paniculata 25 cm. longa, 12 cm. lata; pedicelli 3–5 mm. longa. *Capsula* oblongo-ovoidea, haud compressa, acuta, 15–18 mm. longa, 7–8 mm. diametro, ob valvas fere ad medium bifidas subæqualiter 4-fida, septo persistente a basi sursum recedente et evanido. *Semina* 6–7, elliptica, 10–12 mm. longa alis inclusis, nucleo 4 mm. vix longiore.

Nile Province, Bari Country, *Dawe*, 885.

This is possibly only a state of Grant's plant from the same country, mentioned as *Hymenodictyon* sp. ?, by Oliver in Trans. Linn. Soc. vol. xxix. (1873) p. 82, and in Fl. Trop. Afr. vol. iii. p. 42, although the latter has much broader leaves almost soft to the touch, the hairs being few and not rigid. Oliver's description of the inflorescences as lateral rests evidently on a misconception of Grant's note, quoted in the Trans. Linn. Soc. *l. c.*, there being with Grant's specimen only a detached branch of an inflorescence in the Kew Herbarium. Grant says "A fruit-bearing branch grows opposite a leaf-bearing one."

Randia nilotica, *Stapf*, sp. nov.; affinis *R. dumetorum*, Lam., sed floribus fructibusque minoribus, corollæ tubo breviore annulo piloso ad medium instructo, receptaculo glabro, baccæ cortice exsiccando crustaceo.

Frutex 1·5–5 m. altus; rami rigidi, sæpe subanfructuosi, ramulis induratis spinescentibus 1·5–2 cm. longis armati, cortice albido vel niveo lævi tecti. *Folia* in brachycladiis brevissimis sub spinis ortis fasciculata, obovata, apice rotundata vel subacuta, basi longe cuneatim attenuata, 2–3·5 cm. longa, 1·2–2 cm. lata, crassiuscula, juvenilia cinereo-pubescentia plerumque mox omnino glabrata, nervis lateralibus utrinque 3–4 inconspicuis; petiolus vix ullus; stipulæ minutæ, ciliatæ. *Flores* 1, raro 2 ex apicibus brachycladiorum, erecti vel nutantes, pedicellati; pedicelli ad 5 mm. longi. *Receptaculum* turbinato-globosum, 1·5 mm. longum, glabrum. *Calyx* circiter 5 mm. longus, ad medium 5-partitus; lobi obovati, basi valde contracti, recurvi, decidui, denticulis interjectis. *Corollæ* albæ, tubus vix e tubo calycino exsertus, a basi ad medium glaber, abhinc argenteo-sericeus, intus ad medium annulo denso pilorum instructus; lobi rotundati, 5 mm. diametro, extus argenteo-sericei, intus tenuissime cinereo-velutini. *Stamina* ore inserta; filamenta perbrevia; antheræ oblongæ, 3 mm. longæ. *Stylus* 8 mm. longus; stigma ovoideum, 2-lobum. *Bacca* globosa vel subglobosa, glaberrima, 16–22 mm. diametro, sæpe tubo calycino persistente coronata, cortice vivo ad 3 mm. crasso succulento exsiccando valde contracto tenui. *Semina* numerosa in pulpa purpurea nidulantia, ellipsoidea, subcompressa, 5 mm. longa; testa alutacea, lævis.—*Randia dumetorum*, Hiern, in Fl. Trop. Afr. iii. p. 94, i. p., non Lam.

SENNAAR TO JUR AND ZANZIBAR. Sennaar, *Kotschy*, 400! Abyssinia, Tigre, near Adeganna, *Schimper*, sect. ii. no. 1002! Sudan, Bahr el Jebel, *Muriel*, 4! Jur, near Kurrchuk Ali's Seriba, *Schweinfurth*, 4304! Uganda, Nile Province, *Dawe*, 882! British East Africa, Mombasa, *Wakefield*! *Hildebrandt*, 1965!

Mr. Dawe describes the shrub as pubescent when young. This probably refers to the young long-shoots, of which there are none with the specimens enumerated above, and only some of the leaves of the short-shoots have still retained traces of pubescence. There is, however, a specimen at Kew, collected by Schweinfurth at Donkollo, Eretrea, which consists of young long-shoots with their leaves still attached and with very young short-shoots in the axils of the latter. Most of the leaves of these long-shoots are rather less obtuse than those of the short-shoots and the longest are up to 5 cm. long. They are all softly pubescent, and have broad-triangular scarious stipules. The branches are softly pubescent like the leaves. There are no flowers with the specimen. The fruits accompanying it are, however, exactly like those described above.

Hiern referred (*l. c.*) to *Randia dumetorum* also a specimen collected by Grant in the Madi Country. This very much resembles *Randia nilotica*, but it is *Vangueria tetraphylla*, Schweinf.: Kirk's specimens referred likewise to *Randia dumetorum* belong to two species—one with large oblong fruits, persistently tomentose leaves, and very few, short spines (Tete, Lupata, Chiradzula); the other identical with *R. Lachnosiphonium*, Hochst., a species so far recorded only from Natal.

Pavetta Barteri, *Dawe*, sp. nov.; *P. disarticulatæ*, Galpin, affinis, foliis obtusis, venis lateralibus paucioribus, petiolis brevioribus differt.

Frutex 1–3 m. altus, ramis quadrangularibus, junioribus compressis, cortice suberoso mox desquamato. *Folia* opposita, rarius ternata, subsessilia vel in petiolum 2–10 mm. longum attenuata oblanceolata vel lineari-oblanceolata, 10–25 cm. longa, 2·4–5 cm. lata, apice obtusa glandulosa, subcoriacea, glabra, pallide viridia, conspicue glandulosa imprimis statu juvenili, sparse pellucido-punctata; venæ laterales utrinque 5–8. *Stipulæ* in cupulam 2–3 mm. altam connatæ, subtruncatæ, 1–3-cuspidatæ, cuspidibus apice glanduliferis. *Corymbi* trichotomi, ramos breves robustos axillares terminantes, pedicellis 2–4 mm. longis, floribus tetrameris. *Calyx* cupularis, 1–2 mm. longus, dentibus 4 magis minusve obsoletis. *Corolla* alba, glabra; tubus 1 cm. longus; lobi 6 mm. longi, oblongi, apiculati. *Antheræ* corollæ lobis paullo breviores; filamenta brevia. *Discus* carnosus, glaber. *Ovarium* biloculare, stylo integro valde exserto 2–3 cm. longo. *Bacca* subglobosa, 8–9 mm. diametro, atro-viridis, calyce persistente coronata, 1–2-sperma.

UGANDA. Unyoro, Kafu Valley, *Bagshawe*, 524; Singo District, Bugangadgi, *Dawe*, 122; Acholi, *Dawe*, 869; Madi District, *Speke & Grant*, 740.

UPPER GUINEA. Niger Expedition, at Abok, *Barter*, 324.

This shrub was first collected by Barter on the Niger Expedition in 1858, and subsequently by Speke and Grant in the Madi Country in 1863; in 1904 and again in 1905 by myself, but without flowers. The description of the flower is taken from Dr. Bagshawe's plant in the British Museum, collected in Unyoro in November 1905. Barter's Niger plant has a more strongly toothed calyx than the Nileland specimens.

COMPOSITÆ.

Senecio adnivalis, *Stapf*, sp. nov.; affinis *S. keniensi*, E. G. Baker, et *S. Johnstoni*, Oliver, sed ab utroque floribus radii et disci æquilongis, ab illo præterea lamina foliorum secundum petiolum late decurrente, lana foliorum inflorescentiæque copiosissima, calyculi phyllis longis, ab hac etiam involucri bractearum forma distincta.

Arbor 6–8 m. alta; truncus cortice scabro obtectus, superne parce ramosus, ramis dichotomis foliorum rosulas densas magnas plurium pedium diametro in comam applanatam dispositas gerentibus. *Folia* vetusta emarcida deflexa, oblonga, acuta, basi in petiolum late alatum decurrentia, serrata serraturis sursum decrescentibus infimis interdum at 8 mm. longis, ad 45 cm. longa, ad 14 cm. lata, herbacea, utrinque primo araneoso-piloso demum supra glabrata, subtus præterea in costa copiosissime araneoso-lanata, nervis secundariis obliquis circiter 10–15 mm. distantibus venulis marginem versus laxe anastomosantibus exsiccando prominulis; petiolus a lamina subdistinctus vel sensim in eam abiens, 8–10 cm. longus, cum alis 3·5-4·5 cm. medio lata. *Inflorescentia* erecta, ultra 30 cm. longa, ad 15 cm. lata, bracteato-paniculata; rhachis robusta ramique copiosissime araneoso-lanati; rami inferiores distantes ad 15 cm. longi, in tertia parte infima indivisi; bracteæ primariæ late lanceolatæ, acuminatæ, basi attenuatæ, inferiores ultra 15 cm. longæ et ad 7 cm. latæ, submembranaceæ, araneoso-villosæ, mox glabrescentes; bracteæ ramorum lineares, infimis majoribus exceptis angustæ vel angustissimæ, membranaceæ, capitula vix excedentes. *Capitula* numerosa dense congesta, pedunculis (inferioribus longioribus exceptis) 1 cm. longis vel brevioribus suffulta, 1 cm. alta, ad 1·5 cm. lata; involucri phylla circiter 26, exteriora 12 anguste linearia tenuiter longe acuminata, 12–15 mm. longa, 0·6–0·9 mm. lata, tenuia, araneoso-pilosa vel glabrescentia, interiora 14 latiora, oblonga, caudato-acuminata vel acuta, 13–15 mm. longa, ad 5 mm. lata, interdum late scarioso-marginata, cæterum tenuiter herbacea, pubescentia pilis longis mollibus admixtis. *Flores* lutei, radii circiter 12, feminei, involucri phyllis paulo breviores; corollæ 9–10 mm. longæ, ligula elliptico-oblonga, 3-dentata; flores disci hermaphroditi, circiter 95 eis radii æquilongis; corolla 5-dentata. *Pappus* multisetosus, setis asperulis. *Antheræ* basi brevissime acutæ, connectivo apiculato. *Ovaria* glabra, striata. *Stigmata* truncata, apice papillosa.

Ruwenzori, Mubuka Valley, 2700-4050 m., *Dogget*; *Dawe*, 663.

PLUMBAGINACEÆ.

Plumbago Dawei, *Rolfe*; affinis *T. zeylanicæ*, Linn., sed foliis tenuiter membranaceis basi rotundatis, inflorescentia breviore, calycis setis et lobis longioribus, corollæ lobis majoribus differt.

Fruticulus (Dawe) ramis striatis glabriusculis. *Folia* petiolata, ovata vel ovato-oblonga, acuta vel breviter acuminata, basi rotundata, membranacea, novella lepidota, demum glabrata, lamina 4–10 cm. longa, 2–4 cm. lata; petioli 10–15 mm. longi. *Paniculæ* parce ramosæ, 5–6 cm. longæ. *Bracteæ* ovatæ, acutissimæ, 2–3 mm. longæ. *Flores* breviter pedicellati. *Calyx* tubulosus, basi paullo ampliatus, glanduloso-setosus; lobi subulato-lineares, 3 mm. longi; tubus circa 12 mm. longus. *Corollæ* tubus elongatus, circa 22 mm. longus; lobi elliptico-oblongi, circa 8–10 mm. longi. *Antheræ* breviter exsertæ, lineares, 2 mm. longæ.

Toro, near the Nsongi River, at 4000 feet alt., *Dawe*, 543.

Although near the common and widely diffused *Plumbago zeylanica*, Linn., this species is readily distinguished by the characters pointed out. Mr. Dawe, who collected both species, remarks that the differences between them are still more apparent in the living state.

SAPOTACEÆ.

Mimusops Dawei, *Stapf*, sp. nov.; affinis *M. frondosæ*, Hiern, sed glaberrima, floribus subsessilibus, alabastris resina copiosa illitis, corolla segmentis lineari-oblongis.

Arbor 20–25 m. alta, valde ramosa, glaberrima; rami crassiusculi, cortice fusco verrucoso obtecti. *Gemmæ* resina copiosa illitæ. *Folia* approximata, oblonga, utrinque subacuta, ad 20 cm. longa, 7 cm. lata, coriacea, infra argenteo-glauca, nervis lateralibus patulis, utrinque circiter 25, uti venarum reticulatione utrinque prominulis; costa supra tenui utrinque linea depressa notata infra admodum prominente; petiolus subteres, 3–4 cm. longus. *Flores* 3-meri, fasciculati, 4–2-nati; alabastra resina copiosa illita; pedicelli brevissimi. *Calyx* 7–8 mm. longus; sepala suberecta, oblonga, obtusa, minutissime ciliolata, crassiuscula. *Corolla* alba; tubus cylindricus, 6 mm. longus; segmenta æqualia, lineari-lanceolata, subacuta, vix 5 mm. longa. *Stamina* 6; antheræ oblongæ vel sublanceolatæ, acutæ, 3 mm. longæ; filamenta 3·5–4·5 mm. longa; staminodia lineari-lanceolata, 2·5 mm. longa, at medium 2-fida, lobis tenuiter subulatis. *Ovarium* glabrum, 9-loculare.

Ankole Forest, 1500 m., *Dawe*, 353.

Mimusops ugandensis, *Stapf*, sp. nov.; *M. Elengi*, Linn., similis, sed floribus paulo minoribus, sepalis exterioribus atro-fuscescentibus, interioribus cinereis, corollæ laciniis subacutis (haud tenuiter acuminatis), staminodiis lanceolatis distincta; inter species Africanas *Penduliflora* proxima, sed foliis glaberrimis minoribus, floribus minoribus, sepalorum forma et indumento differt.

Arbor 9–12 m. (vel ultra) alta, gemmis et floribus exceptis glaberrima, ramis cortice fusco tectis. *Gemmæ* brevissimæ, obtusæ, fusco-pubescentes. *Folia* sparsa, oblonga vel obovato-oblonga, breviter et sæpius subabrupte acuminata, acumine circiter 5 mm. longo obtusiusculo, basi breviter acuta, margine undulato, 8–11 cm. longa, 3·5–5 cm. lata, tenuiter coriacea, supra nitida, costa tenui supra utrinque linea depressa notata infra latiore prominente, nervis secundariis 5–7 mm. distantibus subpatulis prope marginem nervo collectivo connexis tertiariis subparallelis interjectis cum venulis areolas elongatas ambientibus utrinque leviter prominulis; petioli 1–1·4 cm. longi, superne tenuiter canaliculati. *Flores* 4-meri, fasciculati, 5–2-ni, penduli; pedicelli 7–8 mm. longi, dense fusco- (rarius fulvo-) pubescentes. *Alabastra* late ovoidea, subobtusa, ad 7 mm. longa. *Calyx* 7·5 mm. longus, late apertus; sepala exteriora ovato-lanceolata, vix acuminata, fusco- (rarius fulvo-) pubescentia, interiora paulo minora, cinereo-tomentella, dorso sulcata. *Corolla* 5·5 mm. longa, fere at basin partita; segmenta æquilonga, interiora angusta oblonga, exteriora lanceolata, omnia subacuta. *Stamina* corollæ æquilonga; antheræ fere 4 mm. longæ, lanceolatæ, quam filamenta paulo longiores; staminodia lanceolata, basi leviter contracta, extus longe denseque villosa, intus glabra, ad 4·5 mm. longa. *Ovarium* villosum, 8-loculare; stylus basi pubescens, 3 lin. longus. *Fructus* (semi-maturus) ovoideus, 2 cm. longus, monospermus, glabratus, olivaceus.

Buddu, 1170 m., *Dawe*, 252.

Mimusops ugandensis var. **heteroloba**, *Stapf* (var. nov.) ♀. *Folia* fere omnia oblonga, cæterum ut in forma typica, petioli 1·3-1·5 cm. longi. *Alabastra* globoso-ovoidea, obtusa, 5 mm. longa; pedicelli demum 8–12 mm. longi. *Calyx* 5·5–6 mm. longus; sepala acuminata. *Corolla* ad 5 mm. longa; segmenta interiora oblonga, apice 2-dentata, quam exteriora lanceolata latiora. *Stamina* corolla duplo breviora antheris efœtis. *Fructus* maturus 2·5 cm. longus, ellipsoideo-ovoideus, luteus. *Semen* oblongum, basi acutum, leviter compressum, antice subcarinatum, 18 mm. longum, 8 mm. latum badium; hilum subbasilare.

Bugoma Forest, 1140–1200 m., *Dawe*, 724; Toro, Kibale Forest, 1350 m., *Dawe*, 509.

From the material available it is impossible to say whether this is merely a sexual (female) state of ***Mimusops ugandensis*** or an independent form; possibly even a distinct species. The Bugoma tree is said to attain a height of 24 m., and the Toro tree is described as a "large, erect tree." This species is referred to in Dawe's 'Report,' p. 14, by a slip as ***Mimusops toroensis***, Stapf.

EBENACEÆ.

Euclea latidens, *Stapf*, sp. nov.; proxima *E. Kellau*, Hochst., a qua differt foliis majoribus, floribus masculis minoribus, corolla depresso-campanulata.

Frutex vel arbuscula glaberrima, ramis ob foliorum bases persistentes subnodosis vetustis cortice griseo tectis. *Folia* subopposita vel subverticillata, oblanceolata vel obovato-lanceolata, apice rotundata, basi longe attenuata, 7–8 cm. longa, 2–3·25 cm. lata, coriacea, exsiccando supra fusco-viridia, subtus pallide badio-fusca, nerv secundariis utrinque 5–6 valde obliquis arcuato connexis rcubus 3–5 mm. a margine distantibus uti venis laxe anastc osantibus subtus vix, supra distincte prominulis; petioli c citer 4 mm. longi, prope basin incrassatam disarticulati. *Ra* *mi masculi* e foliorum superiorum axillis, graciles, 3 cm. l gi, 8–10-flori, ad 1 cm. indivisi; bracteæ minutæ; pedicell nferiores 5·3 mm. longi, curvati. *Calyx* 4-lobus, vix 1·5 n . altus, 3 mm. diametro, lobis late ovatis apiculatis vel sub tusis. *Corolla* depresso-campanulata, 2·8–3 mm. longa, 3 mn diametro, ad fere medium 4-lobata, lobis orbicularibus. *St* *nina* circiter 13; filamenta brevissima; antheræ lanceolata minute apiculatæ, 2·5–2·75 mm. longæ, apiculo minute pil ulo. *Pistilli* rudimentum subulatum, vix 1 mm. longum. *R* *cemi feminei* fructiferi tantum noti, 0·7–1 cm. longi, patente 5–10-flori; pedicelli 1 mm. longi. *Calyx* persistens ut in fl e masculo. *Bacca* globosa, nigra, 5 mm. diametro, monosperma. *Semen* globosum, prope hilum breviter sulcatum et lineis 2 a sulco angulo recto divergentibus tenuibus notatum; testa ab hilo ultra medium intrusa; endosperma osseum.

North-west Ankole, banks of Lake Kafuru, 1100 m., *Dawe*, 431.

APOCYNACEÆ.

Gabunia odoratissima, *Stapf*, sp. nov.; affinis *G. glandulosæ*, Stapf, sed foliis majoribus, nervis numerosioribus, floribus majoribus, calyce intus multiglanduloso diversa.

Arbor 10 m. alta, glaberrima; ramuli teretes, fistulosi, fusco-virides. *Folia* oblonga, basi subacuta, apice breviter acuminata, 15–20 cm. longa, 4·5–6 cm. lata, papyracea, nervis lateralibus utrinque 10–14 patulis prope marginem curvatis; petioli latiusculi, supra canaliculati, 10–12 mm. longi. *Inflorescentiæ* circiter 10-floræ, subcorymbosæ, densiusculæ, pedunculo 4–6 cm. longo suffultæ; bracteæ persistentes, late ovatæ, acutæ vel breviter acuminatæ; pedicelli ad 6 mm. longi, crassiusculi. *Calyx* 5–7 mm. longus; sepala late ovata vel elliptica, obtusa, intus ad basin glandulis numerosis obsita. *Corolla* fragrantissima, alba; tubus gracilis, 9 cm. longus, medio 2 mm. diametro, basi leviter tortus; lobi e basi lanceolata lineares, 4·5–6 cm. longi, ad medium 3–4 mm. lati. *Antheræ* 6 mm. longæ. *Stylus* cum stigmate 5 mm. longus. *Folliculi* oblique ovoidei, 15–16 cm. longi, 12·5 cm. diametro, viridi et albo-variegati (ex *Dawe*).

Western Ankole, in forest, 1800 m., *Dawe*, 352.

Motandra altissima, *Stapf*, sp. nov.; valde affinis *M. pyramidali*, Stapf, sed tomento rufo, paniculis angustioribus densis, corollæ tubo calyce breviter exserto distincta.

Frutex altissime (ad 30 m.) scandens, novellis rufo-tomentosis; rami graciles, mox glabrati, exsiccando nigricantes, minute lenticellati. *Folia* oblonga vel lanceolato- vel elliptico-oblonga, basi obtusa, apice acute acuminata, 6–12 cm. longa, 3–5 cm. lata, tenuiter papyracea, mox præter nervos (infra) glabrata, nervis lateralibus utrinque circiter 7; petiolus 8–10 mm. longus, diutius rufo-tomentellus. *Panicula* ovoidea vel anguste pyramidalis, 3–9 cm. longa, 3–5 cm. lata, densa, ubique rufo-tomentella; pedunculus perbrevis; bracteæ ad ramorum primariorum bases e basi latiore tenuiter subulatæ, 2 mm. longæ, cæteræ minores vel obsoletæ; pedicelli 1 mm. vix longiores. *Calyx* 2·5 mm. longus, dense rufo-tomentellus; sepala lanceolata, acuta vel subacuta. *Corolla* extus ima basi excepta tomentella; tubus vix 3 lin. longus; lobi tubum æquantes, oblongi, obtusi, crassiusculi. *Folliculi* ovoidei, apice incurvo-acuminati, dense fusco-pannosi, ad 2·5 cm. (haud plane maturi) longi, ultra 1 cm. lati.

Mawokota, Bunjiako, 1100–1200 m., *Dawe*, 260; Unyoro Forests, near the Anglo-Congo Frontier, *Dawe*, 702.

BORAGINACEÆ.

Cordia unyorensis, *Stapf*, sp. nov.; *C. abyssinicæ*, R. Br., et *C. Holstii*, Gürke, affinis, sed drupa magna putamine lageniformi distinctissima.

Arbor 20–30 m. alta; rami novelli tenuiter ochraceo-tomentelli, mox glabrescentes et exsiccando nigricantes. *Folia* late ovata vel suborbicularia, subobtusa vel apiculato-acuminata, obscure dentata, basi rotundata, subtruncata vel interdum uno latere acuta et ad petiolum producta, 9–13 cm. longa, 7–11 cm. lata, coriacea, supra glabra, subtus tenuissime densissime ochraceo-tomentosa, nervis lateralibus utrinque 5–6, infimis 2 utriusque lateris fere e basi ortis, venis transversis distinctis circiter 3 mm. inter se distantibus; petiolus subteres, ad 4 cm. longus. *Corymbus* 8–10 cm. diametro, laxiusculus, tenuiter ochraceo-tomentellus; pedunculus 1–4 cm. longus. *Calyx* anguste campanulato-oblongus, 7–8 mm. longus, breviter lateque 5-dentatus, 10-costatus, ochraceo-tomentellus. *Corolla* alba, breviter infundibuliformis, limbo latissime aperto, 2 cm. diametro, fere 2 cm. longa; lobi latissimi, 2–3 mm. alti, margine undulati. *Filamenta* basi pilosa, 8–9 mm. longa. *Ovarium* glabrum; stylus 9 mm. longa. *Drupa* calyci cupuliformi fere 2 cm. alto, costis obliteratis insidens, subovoidea, acuta, 4·5 cm. longa, 3 cm. diametro; pericarpium ad 1 cm. crassum, parte exteriore fibroso-carnosa, interiore mucilaginea; putamen lageniforme ad 32 mm. longum, medio ad 15 mm. crassum, apice basique constrictum et profunde excavatum, inter constrictiones profunde lateque sulcatum, 4-loculare, loculis 2 plermuque minutis vacuis.

Unyoro, Bugoma, and Budongo Forest, *Dawe*, 798.

ACANTHACEÆ.

Acanthus ugandensis, *C. B. Clarke*, sp. nov.; ex affinitate *Acanthi arborei*, Forsk., sed sepalis 2 interioribus 7 mm. longis, ellipticis, apice rotundatis (superne longe ciliatis) distincta.

Parum pilosa. *Folia* superiora oblongo-elliptica, 16 cm. longa, 7 cm. lata, in marginibus usque ad $\frac{1}{3}$ laminæ latitudinem duplicato-pinnatifida, spinosa, lucida; petioli 1 cm, longi. *Spicæ* terminales, 15 cm. longi, densiusculi. *Bractea* 2 cm.

longa, 7 mm. lata, 3-nervis, apice marginibus spinulosa, tenuiter pilosa; bracteolæ 2, 16 mm. longæ, 2 mm. latæ, spinulosæ. *Sepala* 2 antica usque ad apicem connata, 1 cm. longa, ovata, apice obtuse triangularia; sepalum posticum 15 mm. longum, ovatum, apice acuta triangulari. *Flores* omnino *A. arborei*, Forsk., sed e Dawe albi.

UGANDA. Buddu, alt. 3400 feet, *Dawe*, n. 237; Elgon District, *Sir Evan James*.

BRITISH EAST AFRICA, *C. F. Elliott*, n. 244.

In the neighbouring species, *A. arboreus*, Forsk., *A. eminens*, C. B. Clarke, *A. montanus*, T. Anders., the two interior sepals are long, with lanceolate linear tips.

MUSACEÆ.

Musa fecunda, *Stapf*, sp. nov.; affinis *M. Ensetæ*, J. F. Gmel., differt labio exteriore infero corollæ (tepalis quinque connatis) latiore apice breviter obtuseque 3-dentato, intus ad tertiam partem laciniis 2 tenuissime subulatis longis additis, labio interiore (supero) 3-lobo, lobo intermedio subulato lateralibus late rotundatis hyalinis, cæterum firmulo.

Truncus spurius, ventricosus, humilis, basi circumferentia 2 m. *Flores* (teste Dawe) oblonga vel oblanceolato-oblonga, ultra 4 m. longa, costa sæpe rubra. *Bracteæ* inflorescentiam subtendentes oblongæ, obtusæ, 40–45 cm. longæ, 25 cm. latæ, costa infra medium folii totam latitudinem occupante sursum cito attenuata; bracteæ interflorales lanceolato-oblongæ, subacuminatæ, acumine lato obtusissimo, circiter 40 cm. longæ, 12 cm. latæ. *Flores* numerosissimæ. *Receptaculum* anguste clavato-cuneatum, circiter 5 cm. longæ, 0·6–0·75 cm. diametro, glauco-pruinosum, lenticellosum. *Labium exterius* (inferum) lineari-oblongum, apice obtuse 3-dentatum, intus ad tertiam partem laciniis 2 tenuissime subulatis 2–2·5 cm. longis, totum 5 cm. longum, 5–6 mm. latum; *labium interius* (superum) 3-lobum, 15–18 mm. longum, lobo intermedio subulatum, lateralibus late rotundatis hyalinis, cæterum firmulum. *Stamina* 5; antheræ 2·5 cm. longæ filamentis paulo longiores. *Stylus* cum stigmate oblique globoso 3·3 cm. longus. *Infructescentia* cernua, ovoidea, fructibus numerosissimis (ad 418 *teste Dawe*). *Baccæ* 5–13-sperma. *Semina* depresso-globosa circa 15 mm. longa lataque, umbilico excavato.

Toro, Isunga, 1500 m., *Dawe*, 521.

HÆMODORACEÆ.

Sansevieria Dawei, *Stapf*, sp. nov.; affinis *S. guineensi*, Willd., foliis ad 1·5 m. longis, ad 6 cm. latis, utrinque longe attenuatis distincta; floribus ternatim fasciculatis, pedicellis imo apice articulatis.

Folia ensiformia, apice et basi longe attenuata, basi exsiccando plicata vel involuta, rubro-marginata, ad 1·5 m. longa, ad 6 cm. lata, concoloria, glaucescentia. *Inflorescentiæ* pedunculo incluso 6–7 dm. longæ; pedunculus circiter 3·5 dm. longus, medio (vivus) 1 cm. crassus; cataphylla scariosa 6, lanceolata ad 4·5 cm. longa; bracteæ oblongo-lanceolatæ, acutæ, infimæ ad fere 2 cm., superiores ·1 cm. longæ, albidæ; pedicelli 3-natim fasciculati, 2·5–4·5 mm. longi, imo apice articulati. *Perianthium* album; tubus 3 cm. longus, gracilis; segmenta linearia, obtusa, 2–2·2 cm. longa ad 2·2 mm. lata. *Stamina* perianthii segmenta æquantia; antheræ 3 mm. longæ. *Stylus* ad 6·5 cm. longus. *Fructus* haud notus.

Busiro, *Dawe*, 109; Entebbe, *Mahon*, May 6, 1902. According to Mr. Dawe, also in Toro and Unyoro.

Native name, "Bugogwa."

Mr. Dawe tells me that this plant differs considerably from *S. guineensis* in appearance, mainly on account of its very long and narrow leaves. Otherwise it comes very near to *S. guineensis*, and will have to be studied in the field with respect to the distinctive characters mentioned above.

AMARYLLIDACEÆ.

Hæmanthus cyrtanthiflorus, *C. H. Wright*; a speciebus reliquis perianthii segmentis latis oblongis quam tubo multo brevioribus differt.

Bulbus ovoideus, apice in collum longum productus, basi rhizomate oblique descendente 3 cm. diam. instructus. *Folia* elliptica, apice basique attenuata, primum minute furfuracea, demum glabra, circa 23 cm. longa, 7·5 cm. lata, membranacea; nervis lateralibus utrinque 7–10, inconspicuis; petiolus c. 18 cm. longus. *Scapus* lateralis, c. 30 cm. longus, glaber, c. 12-florus; spathæ membranaceæ; pedicelli 2·5 cm. longi, graciles. *Perianthium* rubrum; tubus 3·8 cm. longus, subcylindricus; lobi oblongi, obtusi, apice cucullati, exteriores 12 mm. longi, 4 mm. lati, quam interiores paullo longiores. *Stamina* ad corollæ faucem inserta; filamenta complanata, longe triangularia, 6 mm longa; antheræ 3 mm. longæ. *Ovarium* subglobosum, 4 mm. longum, glabrum. *Bacca* subglobosa, 18 mm. diam., 2-sperma. *Semina* 10 mm. diam.

Ruwenzori, 2400–2700 m., *Dawe*, 620.

DIOSCOREACEÆ.

Dioscorea (§ **Asterotricha**) **fulvida**, *Stapf*, sp. nov.; affinis *D. Schimperianæ*, Hochst. ex Kunth, sed foliis firmioribus sinu angustissimo profundo, fructibus angustioribus distincta.

Caulis scandens, teres, fulvo-tomentellus, mox glabratus, inermis. *Folia* opposita, elliptico-orbicularia, profunde cordata sinu perangusto, apice breviter acuminato-cuspidata, 11–13 cm. longa, 11–11·15 cm. lata, firma, supra glabra, infra fulvo-tomentella, 9-nervia, venis transversis laxis; petiolus 7–8 cm. longus, superne anguste canaliculatus. *Flores* ignoti. *Fructus* in spicas pendulas 10–13 cm. longas dispositi; rhachis gracilis dense fulvo-tomentella, internodiis 3–5 mm. longis. *Capsulæ* ambitu obovato-orbiculares, apice leviter emarginatæ, 2 cm. longæ, 3-lobæ, lobis 1 cm. latis, juniores dense fulvo-tomentellæ, demum loborum lateribus glabris. *Semina* orbicularia, 4 mm. diametro, ala 1 mm. lata circumdata.

Unyoro, *Dawe*, 908.

PANDANACEÆ.

Pandanus chiliocarpus, *Stapf*, sp. nov.; affinis *P. Candelabro*, Beauv., sed syncarpiis majoribus drupis multo longioribus angustioribus apice haud spinulosis et ut videtur foliis majoribus haud glaucis distinctus.

Arbor circiter 9 m. alta, superne ramosa radices fulcientes emittens, ramis comas magnas foliorum gerentibus. *Folia* e basi lata longe gradatim attenuata, ad 3·6 m. longa, basi ad 15 cm. lata, crasse coriacea, spinosa, spinæ costæ subtus acutæ subadpressæ inter basin et medium sursum vel deorsum directæ supra medium omnibus sursum spectantes, inferne 5·3 cm. distantes, superne multo magis approximatæ, spinæ marginum leviter curvatæ prorsus directæ, inferiores ad 3 mm. longæ, superiores multi breviores oblique triangulares. *Inflorescentiæ* (e rhachidis fragmento 45 cm. longo) spicatæ, bractearum cicatricibus inferioribus 7–10 cm. distantibus. *Syncarpium* ovoideum, 30–37 cm. longum, 15–17 cm. diametro. *Drupæ* numerosissimæ (ultra 1000), 1 (rarius 2)-loculares, anguste pyramidato-cuneatæ, 6 cm. longæ, 6–8 mm. diametro, apicibus conicis liberis 6–8 mm. longis subcompressis interdum breviter rostratis stigmate 1 (rarius 2) reniformi vel hippocrepiformi 1·5–2 mm. lato patente coronatis; pericarpium laxe fibrosum; putamen osseum sub medio obtuse 5–6, angulatum utrinque subito contractum, basi breviter conicum, apice longe subulato-conicum (ad 1 cm. longo), totum ad 2 cm. longum.

Toro, by the Usonei and Durra Rivers, *Dawe*, 523; also in Unyoro, in river near Butiaba (according to Dawe).

Dawe states that the habitus of this species resembles very much that of the Screw-pine figured in Schimper's 'Plant Geography,' p. 389. He counted not less than 1845 drupes in one syncarpium. The Waganda name of the plant is "Kisikenki."

GRAMINEÆ.

Panicum (§ **Brachiaria**) **bifalcigerum,** *Stapf*, sp. nov.; affinis *P. falcifero*, Trin., sed racemis cum unoquoque culmo binis, spiculis glaberrimis majoribus acutis, valvis spiculas æquantibus.

Gramen perenne; rhizoma præmorsum, breve; innovationes intravaginales. *Culmi* glabri, 3-nodi, e summa vagina longiuscule exserta. *Foliorum vaginæ* basales angustæ, molliter hirsutæ, imprimis basin versus, demum a culmo solutæ et plicatæ, 3–10 cm. longæ, paucæ, extimæ 2 ad cataphylla brevia elaminata redacta; caulinæ similes sed angustiores, longiores præter nodos minus hirsutæ, summa ad 15 cm. longa. *Racemi spiciformes* 2, leviter falcatim curvati, internodio 3–4 cm. longo separati, densi, secundi, 2-seriati; rhachis herbacea, concava, applanata, 3 mm. lata, glabra, ad margines ciliolata. *Spiculæ* geminatæ, rarius hincinde solitariæ vel ternatæ secundum costam rhachis facialem, brevissime pedicellatæ, lanceolato-ovatæ, acutæ, subacuminatæ, circiter 4 mm. longæ, glabræ. *Glumæ* æquales, 7-nerves superne nervis brevibus nonnullis interjectis, nervis imprimis apicem versus admodum prominulis. *Anthœcium inferum* ♂, glumas subæquans; valva lanceolato-ovata, apice paulo incrassata, 5-nervis; palea valvæ æquilonga, acute 2-carinata, acuta. *Anthœcium superum* ☿ oblongo-ellipsoideum, obtusum, 3·5 mm. longum, læve; valva 5-nervis.

Antheræ fere 3 mm. longæ. *Styli* stigmatibus rufis fere 2 mm. longis æquilongi.

Unyoro, roadsides, *Dawe*, 826.

Poa glacialis, *Stapf*, sp. nov.; ex affinitate *Poæ pseudopratensis*, Hook. f., sed foliis rigidioribus apice ipso recurvis asperulis, ligulis longis, paniculis densis, spiculis ad valvarum bases lana copiosa obsitis, paleis ad carinæ scaberulis (haud ciliatis) distincta.

Gramen perenne, ad 45 cm. altum, glaberrimum, surculos perpaucos emittens; innovationes mixtæ. *Culmi* 2-nodi, nodo superiore 12–20 cm. supra basin sito. *Foliorum* vaginæ basalium latæ, læves, pallidæ, scariosæ, 4–8 cm. longæ, sulcato-striatæ, persistentes, summorum virides, firmiores, 15–17 cm. longæ, superne asperulæ; ligulæ hyalino-scariosæ, lanceolato-oblongæ, 5–10 mm. longæ; laminæ vernationæ plicatæ, deinde explanatæ, lineares, superne attenuatæ, apice ipso recurvæ, ad 8 cm. longæ, 3–4·5 mm. latæ, rigidulæ, multi-nervosæ, imprimis supra asperulæ. *Paniculæ* nutantes vel flexuosæ, densæ, ambitu oblongæ, lobatæ, 10–13 cm. longæ; rami infimi 2-nati, intermediæ 3–4-nati, qui ex nodis infimis orti inæquilongi, longiores interdum ad 7 cm. longi et ad 2½ cm. indivisi, cæteri breves et a basi ramulosi; rami ramulique filiformes, asperuli; pedicelli 2–1 mm. longi. *Spiculæ* congestæ, ex viride et purpureo variegatæ, latæ, 5–6 mm. longæ, 3–4-floræ. *Glumæ* subæquales, lanceolatæ, acutæ vel acutissimæ, 4–5 mm. longæ, carina asperula, inferior 1-nervis; superior 3-nervis. *Rhachis* articuli glabri, breves. *Valvæ* a latere visæ lanceolatæ, peracutæ, superne purpureæ, in parte tertia summa magis minusve albo-marginatæ, 5–7-nerves, carina basi ciliata cæterum scabrida, nervo extimo breviter pilosulo, callo lana copiosa vestito. *Paleæ* valvis paulo breviores, angustæ, 2-dentatæ, in carinis scaberulæ. *Antheræ* 1·7 mm. longæ, luteæ. *Ovarium* anguste oblongum; styli quam stigmata 1 mm. longa multo breviores.

Ruwenzori, Mubuka Valley, 3900–3960 m., up to the glacier, *Dogget*; *Dawe*, 567.

This handsome grass occurs, according to Dawe, scattered among stones and boulders up to the limit of phanerogamic vegetation, forming small tufts owing to its scanty innovations.

Notes on the Vegetation of Buddu and the Western and Nile Provinces of the Uganda Protectorate.

By M. T. Dawe.

The districts visited by me, starting from Entebbe, are:—Busiro, Mawakota, Buddu, Koki, Ankole, Toro (including Mt. Ruwenzori and Semliki Valley), Buyaga, Unyoro, Chiope, Acholi, Madi and Bari; the total distance covered amounting to over 3000 miles.

In the following notes I intend to give such information concerning these districts as bears on the nature of the country, its climatic conditions, and the predominant features of the flora.

My collections comprise nearly a thousand species obtained on the line of route, whilst daily on the march, no halts having been made for the express purpose of collecting. A prolonged stay in these districts would materially have resulted in a far more complete and representative collection.

Busiro, Mawakota, and Buddu.

Busiro and Mawakota lie to the north-west of the Victoria Nyanza, and Buddu lies due west. The flora of these districts, together with Chagwe, the Sesse and Buvumu Islands, shows considerable affinity with that of West Africa.

The low-lying alluvial area, bordering the lake-margin of these regions down to the Anglo-German Boundary, is more or less covered with forest. Receding from the Victoria Nyanza, the country is more hilly, and is mainly composed of grass- and bush-land; but woodland and forest is found in the valleys and low-lying localities. These areas are watered by several rivers flowing into the Victoria Nyanza. The only large and important one, however, is the Katonga, and it is somewhat sluggish, being choked with a dense growth of papyrus and reeds.

The altitude of this region averages about 4000 feet above the sea. The mean maximum temperature in the shade, as represented by Entebbe, which is situated near the lake, is 76° Fahr., the mean minimum is about 63°, and the lowest recorded temperature is 59°. At the higher elevation of Masaka, situated on the hills about twenty miles inland from the Lake shore, the mean maximum is 75°, and the mean minimum 59°. The extremes registered at the latter station are 82° (March 11th, 1904) and 55° (June 10th, 1904). As affecting transpiration, it may be interesting to mention, that the records of 1904 show that Entebbe has a daily average of 5 hours 55 minutes bright sunshine.

This region has no very well-defined seasons. Rain falls throughout the year; but, as represented by Entebbe, July to October are usually the driest months. The average rainfall of the last four years at Entebbe is 55 inches, falling on an average on 138 days in each year, usually as sudden heavy storms, which rarely last more than a few hours. The highest recorded rainfall for any one year (1904) is 63 inches.

On the inlying parts of these districts the rainfall is rather less; but on Sesse Islands, where storms occur almost daily (usually in the morning), it is considerably heavier. The records available indicate that it is not much less than 100 inches per year. During May 1904 as many as 16·84 inches were recorded on the islands.

The prominent features of the forests throughout Busiro and Mawakota are the large trees of the following species :—*Piptadenia africana*, *Pycnanthus Schweinfurthii*, *Pseudospondias microcarpa*, *Parkia filicoidea*, *Chlorophora excelsa*, *Canarium Schweinfurthii*, and *Antiaris toxicaria*. In Bunjiake, which is almost an island, and only connected with Mawakota by swamp, the predominating tree is a species of *Cynometra*; whilst in the northern part of the littoral forest of Budu the principal species are *Piptadenia africana* and *Mæsopsis berchemoides*.

A little further south, *Xylopia Eminii*, which is allied to a West African species *X. æthiopica*, gives a special character to the forest. Still further south, a Conifer—*Podocarpus milanjiana* var. *arborescens*—is found in this littoral belt. It is very singular that it should occur in a low-lying swampy district, at an altitude of considerably less than 4000 feet—a tree which usually affects hill-slopes. In the extreme south of Buddu, *Mimusops cuneifolia* and *Baikaea Eminii* are conspicuous trees; the former has previously been recorded only from Lower Guinea. Another interesting feature in this locality is found in *Eugenia owariensis*, which grows gregariously in the form of small forests isolated in the swamps.

Raphia Monbuttorum and *Phœnix reclinata* are common palms found throughout this forest-region.

From the foregoing, it will be seen that considerable variation is found in the formation of various parts of this littoral forest, as it stretches from a little north of the Equator to one degree south.

KOKI.

The district known as Koki lies to the south-west of Buddu; it is exceedingly hilly and averages about 4500 feet altitude. Its formation is of grassland, woodland being only occasionally found in the deep ravines. The average maximum temperature in the shade during my stay in Koki (May) was 76°, and the minimum frequently fell to 55°. In certain parts of Koki the soil is calcareous; in other parts, especially the hills, it is laterite, and schistose rocks crop up on the surface.

The natives inhabit the valleys or low-lying parts of Koki, so that an overland view from the hills gives an appearance of desolation. I am informed by the White Fathers of the Roman Catholic Mission that the rainfall is less than that of Buddu, which is to be expected, seeing that it is destitute of forest.

The following are conspicuous shrubs found in Koki:—*Securidaca longipedunculata*, *Parinarium curatellifolium*, *Euphorbia antiquorum*, *Pappea ugandensis*, *Carissa edulis*, *Dichrostachys nutans*, *Gardenia Thunbergia*, *Erythrina tomentosa*, *Rhus insignis*, *Olea chrysophylla*, *Acacia Gerrardi*, and two species of *Dombeya* (*D. Mukole* and *D. Dawei*). The latter affords a useful fibre known as Nkokwa; the former is a small tree also common in Chagwe in the Mahira Forest. A new species of *Bersama*, *B. ugandensis*, is found here; it is a small tree.

The flora of Koki has a slight affinity to the flora of South Africa. Notable examples in my collection are *Acacia Gerrardi*, a species from Natal and Zululand, not hitherto recorded from Tropical Africa; *Pappea ugandensis*, a species previously collected by Dr. Bagshawe on the Anglo-German Boundary Commission, and allied to *P. capensis*.

ANKOLE.

Ankole lies in the Western Province of Uganda, and the portion I passed through has an altitude ranging from about 4000 to 6000 feet. With the exception of the western parts of Ankole, the country is composed of rolling grass-hills and wide expanding valleys, while the extreme low-lying parts are usually covered with acacia woodland. In certain central localities there is a striking absence of shrubs of any description; so scarce are they in some places where I camped, that cooking had to be done with dried stems of papyrus, found in swamps and streams.

The shrubs found in Koki are also common in the shrub-land of Ankole. At the higher elevation on the hills of West Ankole the following interesting specimens are found: *Lobelia Giberroa*, *Gnidia lamprantha*, *Phillipia Stuhlmannii*, *Agauria salicifolia*, *Acacia Gerrardi*, *Schizoglossum eximium*, *Asclepias glaucophylla* and *A. macrantha*; also *Faurea saligna*, a small tree common in the Transvaal.

The western part of Ankole is densely wooded, and forest covers a large area east of Lake Albert Edward. I did not spend sufficient time in this forest to gain much idea of what it contained, but collected the following trees: *Parinarium excelsum*, *Symphonia globulifera*, *Zanthoxylum* sp., a *Strombosia*, and four new species—*Carapa grandiflora*, *Pseudocedrela excelsa*, *Mimusops Dawei*, and *Gabunia odoratissima*. Both the *Pseudocedrela* and *Carapa* are valuable timber trees: the latter also affords an oil.

North of this forest, beyond the plateau which terminates in an escarpment about ten miles from Lake Kufuru, woodlands formed of flat-topped acacias, alternating with bushland of *Euphorbia antiquorum* and *Capparis tomentosa*, stretch down to the shores of the lake. Forest is absent from the shores of Lake Kufuru, on both sides being a stretch of arid land.

In the extreme north-west of Ankole the land is densely wooded, chiefly with *Albizzia Brownei* and *Albizzia coriaria*. A small forest is found in the Bwezu district; and conspicuous among the trees found there are: *Phœnix reclinata*, *Cordia abyssinica*, *Cola cordifolia*, *Neoboutonia canescens*, *Pseudospondias microcarpa*, and a new species of *Pterygota*—a handsome tree belonging to Sterculiaceæ.

The mean maximum temperature of Ankole, as represented by Mbarara (1904), which is the administrative station, is 77·8°, the mean minimum 55·6°, the extreme minimum (12th November) being 45°. This may be taken as representative of the greater portion of the plateau of Ankole, which lies at about 5000 feet. In the forest-region of West Ankole the minimum was 53°

(June). Below the plateau, on the plains near the lake, the maximum temperature ranged from 90° to 92°, and the minimum from 65° down to 63°.

TORO.

This district is also in the Western Province, and lies south of Lake Albert, extending down to Ankole, being bounded on the west by the Congo Free State. It lies from about 3000 feet altitude to Mt. Ruwenzori, the highest peak of which yet reached is 15,000 feet.

The portion of Toro lying from 4000 to 5000 feet is physically somewhat similar to certain parts of Uganda proper, where high grass and swampy streams choked with papyrus are the characteristic features. This part of Toro, as represented by Fort Portal, has a mean maximum temperature of 75° and a mean minimum of 59·9°. The extreme minimum during 1904 was 51·3°. The average rainfall is 53·14 inches, falling on an average on 134 days in each year.

In the east-central part of Toro, forest (Kibale Forest) covers an area of nearly two hundred square miles. It extends from east of Fort Portal down to the northern extremity of Lake Ruisimba. Its characteristic trees are *Maba abyssinica*, *Dolichandrone platycalyx*, *Parinarium excelsum*, *Ehretia sylvatica*, *Symphonia globulifera*, *Cola cordifolia*, *Chrysophyllum albidum*, *Croton zambesicus*, *Milletia ferruginea*; also the following new species: *Balanites Wilsoniana*, *Odyendyea longipes*, *Mimusops ugandensis*, *Lovoa brachysiphon*, *Dactylopetalum ugandense*, and *Warburgia ugandensis*.

Lying to the south-west of this forest at a lower altitude occurs another forest, which is remarkably free of undergrowth and composed almost entirely of *Cynometra Alexandri*, an immense gregarious tree, also found in the Semliki Valley and Unyoro.

The northern extremity of Lake Ruisimba is hid from view on the plains by several hundred acres of *Typha angustifolia*. The flat country lying west of these forests and the lake is of a low altitude, and is studded with *Borassus* palms (*B. flabellifer*, var. *æthiopica*). Important rivers watering these plains are the Mubuku and Luimi, which rise in the Ruwenzori Range.

Mt. Ruwenzori.

The inhabitants of Mt. Ruwenzori form a tribe known as Bakonjo. They do not inhabit the mountain higher than 7000 feet, but make, even up as far as the glacier, frequent hunting excursions after the hyrax, the flesh of which they are very fond. They are remarkable examples of physical strength and durability.

No cultivation is therefore found on the mountain higher than the habitations of these people. The banana does not thrive above 6000 feet. *Colocasia antiquorum* forms an important article of culture for food at the higher altitude mentioned.

The plants collected on the Ruwenzori were obtained mainly from the Mubuku Valley, only a few additional species being collected on the northern flank of the mountain, which I crossed on returning from the Semliki Valley.

In the Mubuku Valley, on the lower slopes of the range, there are dense forests, in which the most conspicuous trees are *Symphonia globulifera* and a new species of *Pseudocedrela* (*P. utilis*), which is a valuable timber tree of enormous dimensions.

On the hill-forests at 6000–7500 feet, one of the most striking trees is *Dombeya runsorensis.* Other species which form the special feature of the vegetation of this altitude are: *Lobelia Giberroa*, *Musa fecunda* (a new species), *Dracæna reflexa, Phillipia Stuhlmannii, Cyathea Dregei, Kigelia Moosa, Epipactis africana*, and *Disperis nemorosa.* Another interesting shrub found at this altitude is *Gymnosporia gracilipes*, var. *arguta.*

From 8000-9000 feet bamboos (*Arundinaria* sp., probably *A. alpina*) form an almost impenetrable zone. Within this range the following were amongst the interesting species collected: *Podocarpus milanjianus, Cornus Volkensii, Ericinella Mannii, Myrsine rhododendroides, Pentas occidentalis, Rubus Doggettii, Hypericum lanceolatum*, and a new and somewhat anomalous species of *Hæmanthus* (*H. cyrtanthiflorus*).

Beyond this altitude, *Erica arborea*, *Podocarpus milanjiana*, and *Brayera anthelminthica* are the only noteworthy trees.

The "tree Lobelias" form the most striking arboreal vegetation at the higher altitude; there are four species on the mountain. *Lobelia Giberroa* is found from 6000 to 7000 feet; *L. Stuhlmannii* from 9800 up to 11,000 feet, where it is replaced by *Lobelia Deckenii*, a species that grows gregariously in morass; *L. rhynchopetalum* is found from about 12,000 feet up to the glaciers.

A new species of arboreal *Senecio* (*S. adnivalis*) is found from about 10,000 feet up to the glaciers, being most abundant in the flat morass in the portion of the valley immediately beneath the glaciers.

Three species of *Alchemilla* are found on the mountain, two of which are new. *A. geranioides* (n. sp.) is found from 8000 to 11,000 feet; *A. Stuhlmannii* from 9000 to 10,000 feet, and *A. ruwenzoriensis* (n. sp.) from 10,000 to 11,000 feet. The latter rambles widely, forming conspicuous carpets on the mountain, its silvery foliage harmonising with the silvery micaceous rocks and grey weeping *Usnea* that gracefully hangs from *Erica arborea* and *Senecio adnivalis.*

The filmy ferns common in the upper portion of the mountain are *Hymenophyllum Meyeri* and *H. ciliatum*, together with *Polypodium punctatum*, var. *rugulosum.*

The last form of vegetation I observed on the mountain (excluding the lower forms) was a solitary grass, a new species of *Poa* (*P. glacialis*).

The following are the temperatures registered by me on the mountain:—at 8500 feet, maximum 56°, minimum 48°; at 9750 feet, maximum 52°, minimum 38° when ascending, on descending 32°. At the base of the glacier the temperature, as would be expected, was at freezing-point at eight o'clock in the morning. On the upper region of the mountain rain falls almost daily in the form of heavy mists, and the vegetation throughout the day is usually dripping with moisture.

SEMLIKI VALLEY.

The Semliki Valley lies between the Ruwenzori Range and the Bulega and Mboga hills. It is watered by the Semliki River, that flows into the south end of Lake Albert. The northern part of the valley near the lake is of grassland (mostly *Imperata arundinacea*); it lies at an average altitude of about 2500 feet, and has a remarkably fertile soil. Further up the river is a dense forest of majestic trees, covering the undulated Bwamba country; it is inhabited by forest tribes, mainly the Baamba people, and forms part of the great Congo Forest. It lies at an average altitude of nearly 3000 feet.

Of the forest trees the following are the most interesting species: *Cynometra Alexandri*, *Ricinodendron africanum*, *Pachystela Msola*, *Musanga Smithii*, *Khaya anthotheca*, *Balanites Wilsoniana*, *Dolichandrone platycalyx*; and, in the higher parts of the forest near the Ruwenzori Range, a new species of *Bombax* (*B. reflexum*) and an *Irvingia*.

On the western side of the river the country is park-like, being picturesquely studded with *Borassus* palms, while in the bush-land *Elæis guineensis* (the African Oil-palm) occurs.

BUYAGA.

The district of Buyaga lies between Toro and Unyoro. It is separated from the former by the Musisi River, and from the latter by the Ngusi, both of which flow into the Albert Nyanza. It forms portion of the great plateau that terminates in an escarpment of the Albert Nyanza.

The portion of Buyaga I passed through in proceeding from Toro to Unyoro is of an undulating nature, huge granitic boulders standing out conspicuously on the hills. The greater portion is of shrub- or bush-land. Amongst the interesting species collected here are the following:—*Hymenocardia acida*, *Protea madiensis*, *Bauhinia reticulata*, *Mucuna stans*, *Anona senegalensis*, a *Cussonia*, and a new species of *Terminalia* (*T. velutina*), the bark of which is used by the natives for tanning.

UNYORO.

Unyoro also forms part of the Western Province. It is a large district, extending northwards from the Ngusi River to the Victoria Nile, that flows into the north-eastern end of the Albert Nyanza. It consists for the most part of a plateau that lies at an elevation of 4000 to nearly 5000 feet above the sea, and ends in the north-west in a steep escarpment, at the foot of which lies, nearly 2000 feet below, the Albert Nyanza.

The physical aspect of the country differs somewhat from that of the Uganda Province. The more sharply defined peak- or ridge-like hills give a peculiarity to the country, which contrasts strikingly with the more rounded, undulating ridges common to the districts near the Victoria Nyanza.

The plateau region of Unyoro is remarkably fertile and is characterized by a deep loamy soil. It consists chiefly of elephant grassland, with dense bushland in certain parts, especially in the north. Other parts are almost park-like, studded with small trees of *Vitex Cienkowskii*, *Erythrina tomentosa*, and *Cordia abyssinica*.

The eastern part of Unyoro is intersected by a number of sluggish rivers, choked with reeds and papyrus. They drain through swampy valleys into the large Kafu River, which finds its way into the Nile. The Kafu valley is clothed with dense bush, and the river itself has wide, almost impassable marshes of papyrus.

Of the interesting species found in the open land of Unyoro I may quote the following:—*Ampelocissus Chantinii* (a vine affording edible grapes), *Bauhinia fassoglensis*, *Vernonia infundibularis*, *Senecio ruwenzoriensis* (a species previously collected by Dr. Bagshawe on the Anglo-German Boundary Commission), *Heteromorpha arborescens*, and *Clerodendron cordifolium*.

On the sandy plains below the rugged, rocky escarpment, the flora differs considerably from that of Unyoro generally, agreeing with that of the low-lying land of the Nile Province.

The western part of the Unyoro plateau is composed of dense forests known as Budongo and Bugoma, which taken together cover an area of approximately 600 square miles. The characteristic trees of the Unyoro forests are:—*Cynometra Alexandri*, *Erythrophloeum guineense*, *Ricinodendron africanum*, *Chlorophora excelsa*, *Balanites Wilsoniana*, *Cassia Sieberiana*, *Khaya anthotheca*, *Celtis Soyauxii*, *Mæsopsis berchemoides*, *Funtumia elastica* and *F. latifolia*, *Maba abyssinica*, an *Alstonia*, and a *Dracontomelum*. The following new trees were found in these forests:—*Pseudocedrela utilis*, an immense and valuable timber tree; *Cordia unyorensis*, a large tree used by the natives for making drums; *Balsamocitrus Dawei*, a new genus in Rutaceæ; *Mimusops ugandensis*, and *Lovoa budongensis*.

The northern part of Unyoro forms a sub-district known as Chiope. It differs considerably in the nature of its climate and soil; the climate is much warmer and the soil is poorer than further south. The greater portion of Chiope is formed of dense bushland. Of the interesting species found there I may mention the following:—*Balanites ægyptiaca*, *Sterculia cinerea*, *Tamarindus indicus*, *Sarcocephalus Russeggeri*, *Stereospermum Kunthianum*, *Strychnos Burtoni*, *Ficus Sycamorus*, *Peucedanum* *fraxinifolium*, *Protea madiensis*, *Dombeya multiflora* var. *vestita*, and *Crossopteryx Kotschyana*.

ACHOLI.

The Acholi (Shuli) country lies in the Nile Province on the north side of the Victoria Nile. The banks of the river are clothed with a narrow strip of forest, and in the valley a few conspicuous trees are found, such as *Antiaris toxicaria* and *Kigelia æthiopica*.

The physical aspect of the eastern part of Acholi differs considerably from Unyoro. It consists mainly of slightly undulating country of bush- and grass-land. Many parts of eastern Acholi attain an altitude of over 4000 feet. The climate seems to be fairly temperate in the neighbourhood of Fatiko, and it is said that fever is unknown there amongst the natives. I am informed that rain falls throughout the year except during the months of December to February, but there are no meteorological records available for this part of Acholi.

The common grass found throughout Acholi (*Andropogon filipendulus*) is of a wiry nature. In marching through this country one may traverse miles and not see a single tree. The common tree found in the grassland from the Victoria Nile to 3° north is *Kigelia æthiopica*, a welcome one to the weary traveller in that it affords delightful shade.

Interesting species found a few miles north of the Victoria Nile are :—*Tetrapleura nilotica*, *Pseudocedrela Kotschyi*, *Cratæva Adansonii*, *Strychnos Burtonii*, *Afzelia africana*, *Cassia goratensis*, and *Prosopis oblonga*.

At the higher elevation in the vicinity of Fatiko there is a strikingly large number of Terminalias that lend a special character to the landscape. They belong to three species—*T. macroptera*, *T. Spekei*, and *T. Dawei*, of which the two latter are new. *T. Spekei* had already been collected by Speke and Grant.

From Fatiko towards Nimule the two most striking trees are *Butyrospermum Parkii* and *Ficus Sycomorus*. The seeds of the former are used as food by the natives, and the sweet fruits of the latter are eaten. It may be also interesting to mention that the Acholi people domesticate bees usually in this species of *Ficus*. Their hives are long and of cylindrical form, made of bamboos or wattle. The bees have been identified by Colonel Bingham as *Apis mellifera* (race *Adansoni*), and he informs me that, with the exception of the fellaheen of Egypt, no African people, so far as he knows, have ever domesticated bees.

Jatropha Curcas is sometimes used for fences round Acholi villages, and it is usual to find a plant of *Jatropha Kirkii* growing fenced around in the corner of a village. The latter has a huge tuberous rootstock, into which the natives thrust their spears before leaving their village on a hunting-expedition. I failed to ascertain whether it was with a view to poison their spears or as an omen of good luck that this is done.

The Acholi people live mainly on grain, scorn to wear clothes, and seem to be a healthy people, except in districts where the guinea-worm is a pest. The chief food-products are: *Eleusine coracana*, *Sesamum indicum*, *Phaseolus vulgaris* and *P. Mungo*, *Cajanus indicus*, and maize. They also cultivate *Ceratotheca sesamoides*, a plant allied to the semsem, for its seeds, which are used for food in a similar way. A Labiate—*Hyptis spicigera*—is also cultivated for its seeds, the food prepared from which is much relished by these people.

MADI AND BARI COUNTRIES.

The rest of my collection was made on the usual route from Nimule to Gondokoro, the distance between these stations being about 107 miles.

Nimule is situated on the banks of the Nile, and is a very unhealthy station, with a dismal, rocky aspect. The maximum temperature in the shade frequently stands at 100°, while the average minimum is 65·2°. The yearly rainfall is scarcely 40 inches, which falls on about 70 days in the year.

Bari, as represented by Gondokoro, has an average maximum of 87·9° and an average minimum of 67·4°, the extremes are 100° and 52°. The rainfall averages 41·91 inches, falling on an average of 92 days in the year. These districts are sometimes subject to droughts; the hottest months are November, December, and January.

The following are the interesting species collected from Nimule to Gondokoro:—*Acacia Seyal*, *Adenium coëtaneum*, *Afzelia africana*, *Anogeissus leiocarpa*, *Borassus flabellifer* var. *æthio-*

pica, *Butyrospermum Parkii*, *Cassia Sieberiana*, *Dalbergia melanoxylon*, *Echinops longifolius*, *Grewia populifolia*, *Hexalobus senegalensis*, *Lophira alata*, *Khaya senegalensis*, *Nicotiana rustica*, *Odina fruticosa*, *Pseudocedrela Kotschyi*, *Sclerocarya Birroea*, *Tetrapleura nilotica*, *Trichilia emetica*, *Turræa nilotica*, *Vangueria edulis*, *Zizyphus abyssinica* and *Z. orthacantha*, also a new species of *Randia* (*R. nilotica*) and *Acridocarpus* (*A. ugandensis*).

The *Borassus* palm does not extend much beyond 4° N. in the Nile Province, and the *Hyphæne* palm (*H. thebaica*) not further south than the vicinity of Gondokoro; but the latter is abundant throughout the Sudan.

EXPLANATION OF THE PLATES.

PLATE 21.

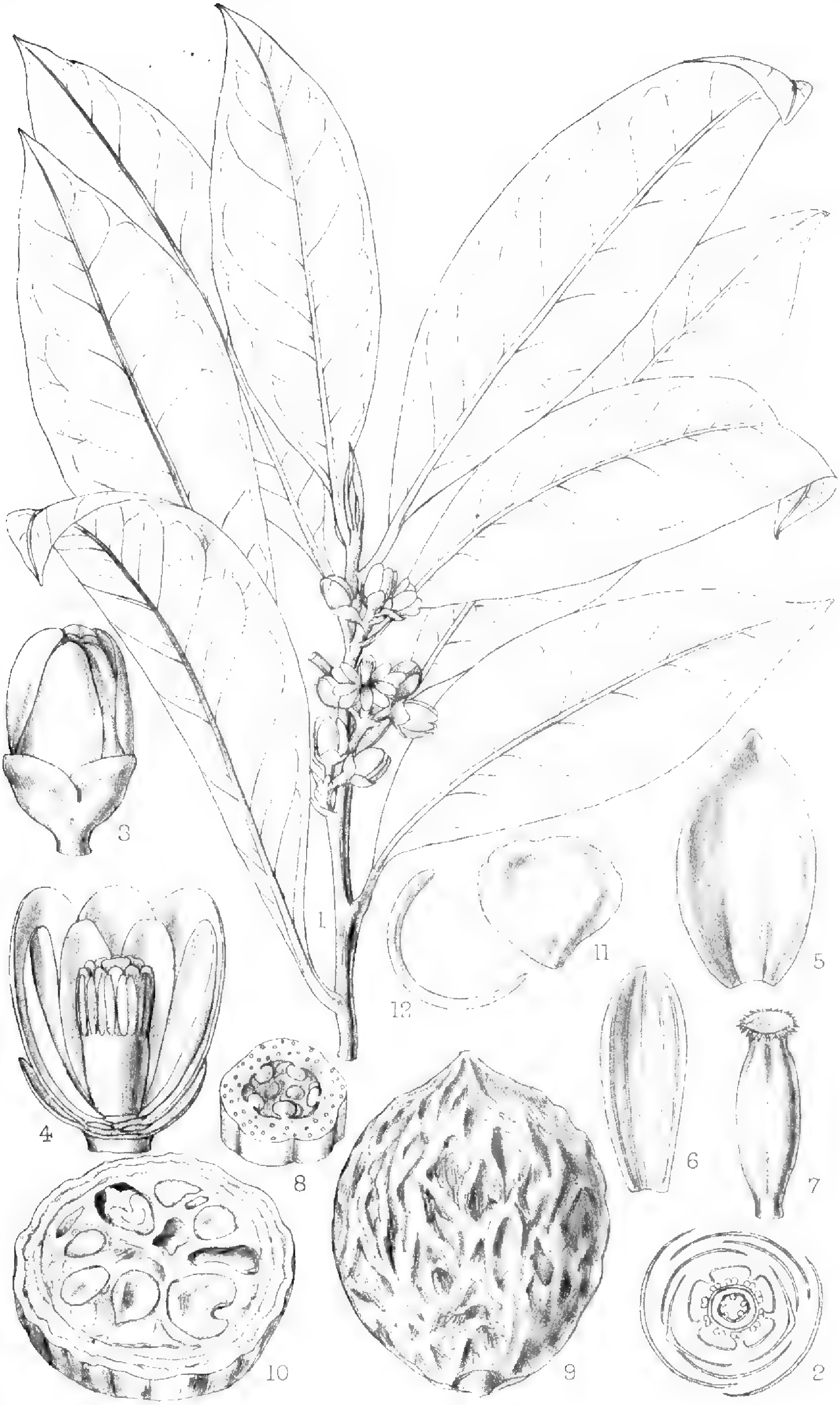
Warburgia ugandensis, Sprague.

Fig. 1. Flowering branch, natural size.
2. Diagram of flower.
3. Flower-bud, enlarged.
4. Section of flower, enlarged.
5. Outer petal, enlarged.
6. Inner petal, enlarged.
7. Pistil, enlarged.
8. Cross section of ovary, enlarged.
9. Fruit, natural size.
10. Cross section of fruit, natural size.
11. Seed, natural size.
12. Embryo, enlarged.

PLATE 22.

Balsamocitrus Dawei, Stapf.

Fig. 1. Flowering branch, natural size.
2. Flower bud, enlarged.
3. Flower, with corolla removed, enlarged.
4. Stamen, enlarged.
5. Cross section of ovary, enlarged.
6. Section of fruit, natural size.
7. Seed, natural size.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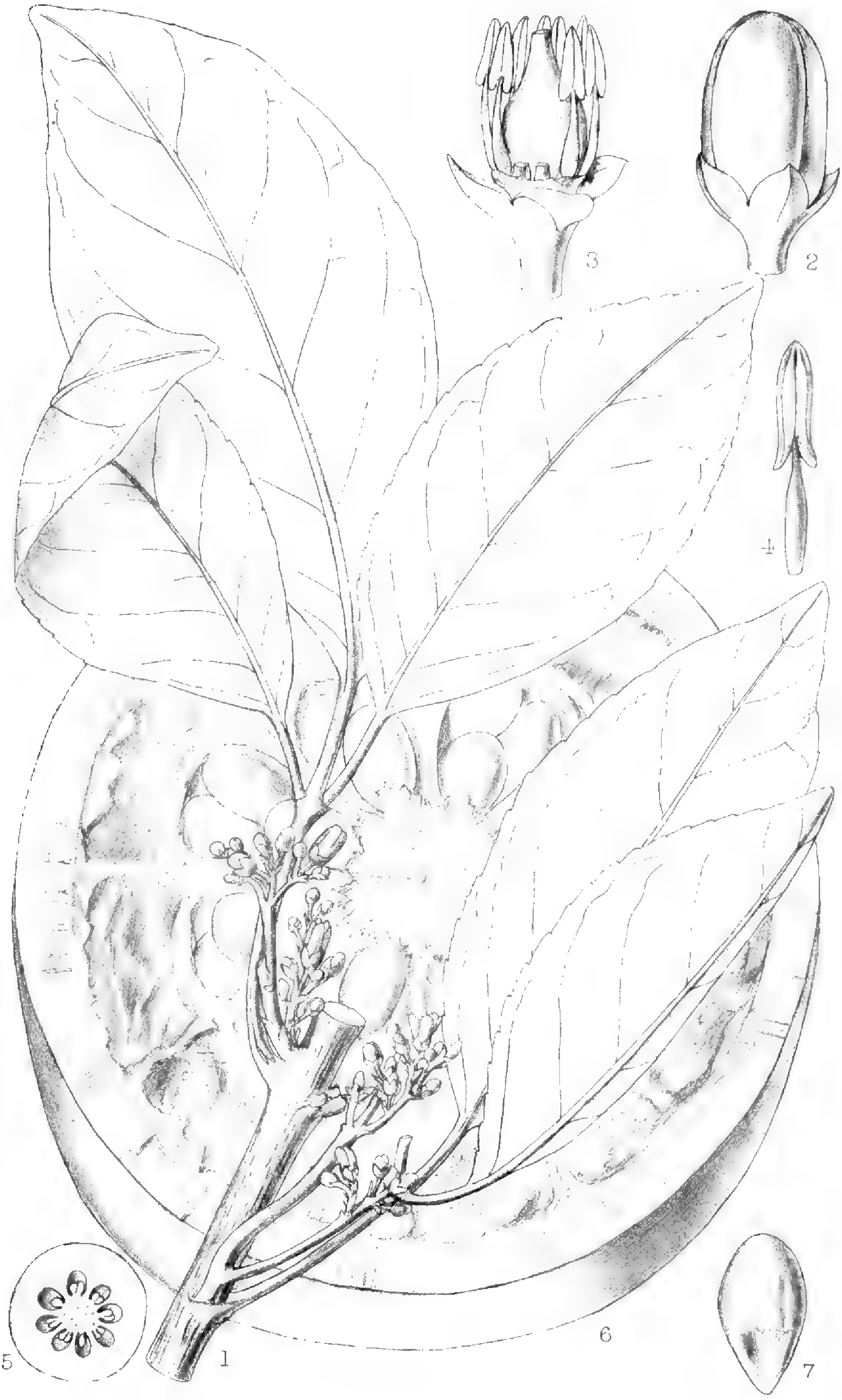
M. Smith del
F. H. Michael lith.

West, Newman imp.

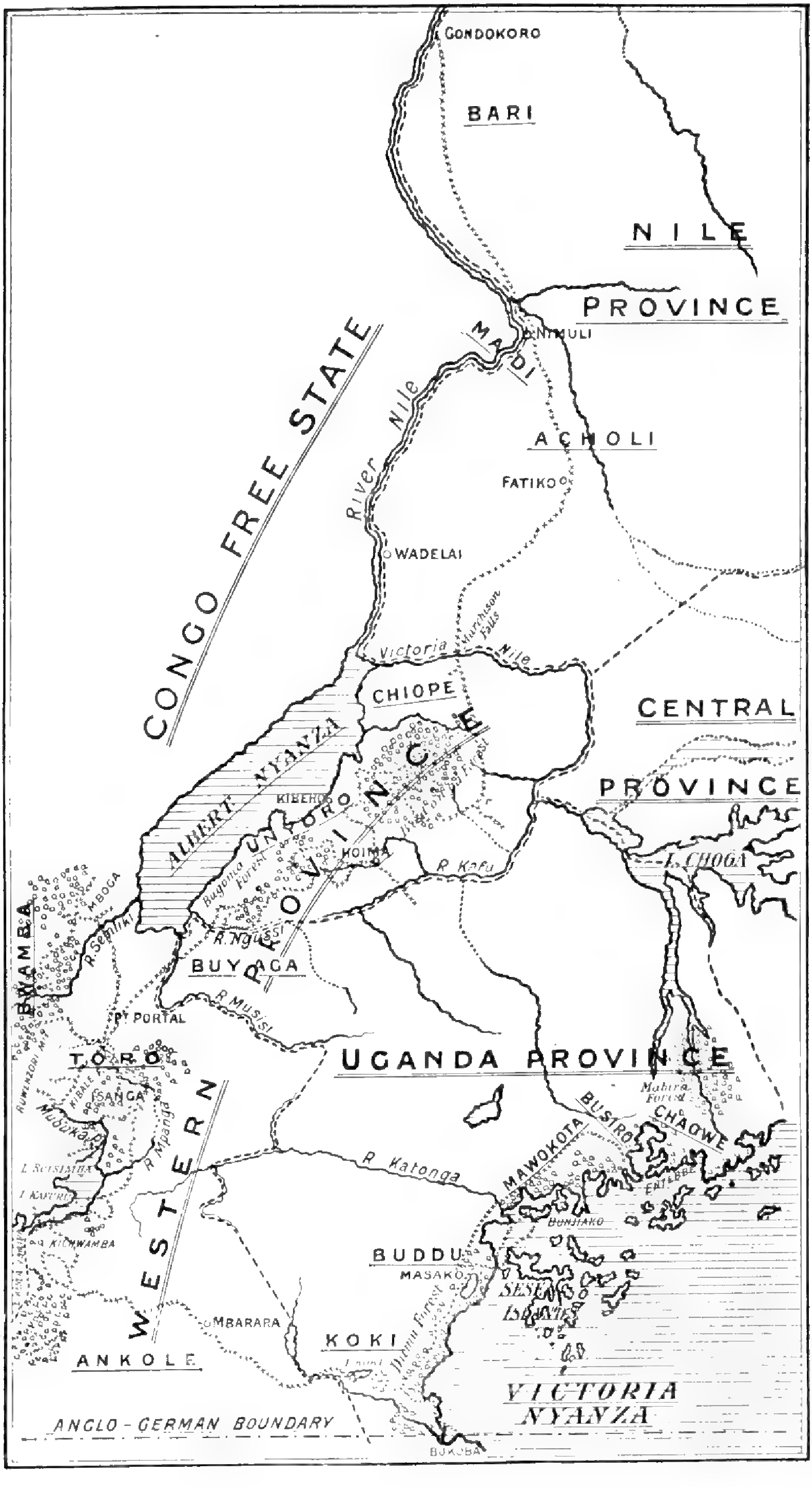
WARBURGIA UGANDENSIS.



M. Smith del.
F.H. Michael lith.

BALSAMOCITRUS DAWEI.

West, Newman imp.


GONDOKORO
BARI
NILE
PROVINCE
NIMULI
MADI
CONGO FREE STATE
River Nile
ACHOLI
FATIKO
WADELAI
Murchison Falls
Victoria Nile
CHIOPE
CENTRAL
PROVINCE
ALBERT NYANZA
KIBERO
UNYORO
PROVINCE
Forest
HOIMA
Bugoma Forest
R. Kafu
L. CHOGA
MBOGA
BWAMBA
R. Semliki
R. Ngussi
BUYAGA
R. Musisi
Pt. PORTAL
TORO
RUWENZORI MTS
KIBALE
ISANGA
Mubuka R.
R. Mpanga
WESTERN
UGANDA PROVINCE
Mabira Forest
BUSIRO
CHAOWE
MAWOKOTA
ENTEBBE
R. Katonga
L. RUISIMBA
L. KAFURU
KICHWAMBA
BUNJAKO
BUDDU
MASAKO
SESE ISLANDS
MBARARA
ANKOLE
KOKI
Buddu Forest
VICTORIA NYANZA
ANGLO-GERMAN BOUNDARY
BUKOBA

MAP TO ILLUSTRATE MR. DAWES'S JOURNEY.

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[Synonyms and native names are printed in *italics*. A star is added to names which are ostensibly here published for the first time.]

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